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BIOAVAILABILITY OF LEAD IN SOIL SAMPLES FROM THE JASPER COUNTY, MISSOURI SUPERFUND SITE

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EXECUTIVE SUMMARY

A study using young swine as test animals was performed to measure the gastrointestinal absorption of lead from three soil samples from the Jasper County, Missouri Superfund site. Young swine were selected for use in the study primarily because the gastrointestinal physiology and overall size of young swine are similar to that of young children, who are the population of prime concern for exposure to soil lead.

The three test soils were composites from different areas of the site. The first sample contained 10,800 ppm lead, and was referred to as the "High Level Smelter" (HL Smelter) sample. The second sample contained 4,050 ppm lead, and was referred to as the "Low Level Yard" (LL Yard) sample. The third sample contained 6,940 ppm lead, and was referred to as the "High Level Mill" (HL Mill) sample. Groups of 5 swine were given average oral doses of 6.94, 20.8, or 62.5 mg/kg-d of HL Smelter soil, 18.5, 55.6, or 167 mg/kg-d of LL Yard soil, or 10.8, 32.4, or 97.3 mg/kg-d of HL Mill soil for 15 days. This corresponded to target average doses of 75, 225, or 675 ug/kg/day of lead. Other groups of animals were given a standard lead reference material (lead acetate) either orally at doses of 0, 75, or 225 ug Pb/kg-day, or intravenously at a dose of 100 ug Pb/kg-day. The amount of lead absorbed by each animal was evaluated by measuring the amount of lead in the blood (measured on days -4, 0, 1, 2, 3, 5, 7, 9, 12, and 15), and the amount of lead in liver, kidney and bone (measured on day 15 at study termination). The amount of lead present in blood or tissues of animals exposed to test soils was compared to that for animals exposed to lead acetate, and the results were expressed as relative bioavailability (RBA). For example, a relative bioavailability of 50% means that 50% of the lead in soil was absorbed equally as well as lead from lead acetate, and 50% behaved as if it were not available for absorption. Thus, if lead acetate were 40% absorbed, the test material would be 20% absorbed.

The RBA results for the three samples from the Jasper County site are summarized below:

Measurement Endpoint	Test material		
	HL Smelter	LL Yard	HL Mill
Blood Lead AUC	0.56	0.78	0.82
Liver Lead	0.55	0.70	0.94
Kidney Lead	0.92	1.10	0.66
Bone Lead	0.50	0.77	0.50

Because the estimates of RBA based on blood, liver, kidney, and bone do not agree in all cases, judgment must be used in interpreting the data. In general, we recommend greatest emphasis be placed on the RBA estimates derived from the blood lead data. This is because blood lead data are more robust and less susceptible to random errors than the tissue lead data, so there is greater confidence in RBA estimates based on blood lead. In addition, absorption into the central compartment is an early indicator of lead exposure, is the most relevant index of central nervous system exposure, and is the standard measurement endpoint in investigations of this sort. However, data from the tissue endpoints (liver, kidney, bone) also provide valuable information. We consider the plausible range to extend from the RBA based on blood AUC to the mean of the other three tissues (liver, kidney, bone). The preferred range is the interval from the RBA based on blood to the mean of the blood RBA and the tissue mean RBA. Our suggested point estimate is the mid-point of the preferred range. These values are presented below:

Test Material	Relative Bioavailability of Lead		
	Plausible Range	Preferred Range	Suggested Point Estimate
HL Smelter	0.56-0.66	0.56-0.61	0.58
LL Yard	0.78-0.86	0.78-0.82	0.80
HL Mill	0.82-0.70	0.82-0.76	0.79

These RBA estimates may be used to help assess lead risk at this site by refining the estimate of absolute bioavailability (ABA) of lead in soil, as follows:

$$ABA_{soil} = ABA_{soluble} \cdot RBA_{soil}$$

Available data indicate that fully soluble forms of lead are about 50% absorbed by a child. Thus, the estimated absolute bioavailability of lead in the HL Smelter, LL Yard, and HL Mill soils are as follows:

Test Material	Absolute Bioavailability of Lead		
	Plausible Range	Preferred Range	Suggested Point Estimate
HL Smelter	28%-33%	28%-30%	29%
LL Yard	39%-43%	39%-41%	40%
HL Mill	35%-41%	38%-41%	40%

These absolute bioavailability estimates are appropriate for use in EPA's IEUBK model for this site, although it is clear that there is both natural variability and uncertainty associated with these estimates. This variability and uncertainty arises from several sources, including : 1) the inherent variability in the responses of different individual animals to lead exposure, 2) uncertainty in the relative accuracy and applicability of the different measurement endpoints, 3) the extrapolation of measured RBA values in swine to young children, and 4) the potential effect of food in the stomach on lead absorption. Thus, the values reported above are judged to be reasonable estimates of typical lead absorption by children at this site, but should be interpreted with the understanding that the values are not certain.

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BIOAVAILABILITY OF LEAD IN SOIL SAMPLES FROM THE JASPER COUNTY SITE REGION VII

1.0 INTRODUCTION

Absolute and Relative Bioavailability

Bioavailability is a concept that relates to the absorption of chemicals and how absorption depends upon the physical-chemical properties of the chemical and its medium (e.g., dust, soil, rock, food, water, etc.) and the physiology of the exposed receptor. Bioavailability is normally described as the fraction (or percentage) of a chemical which enters into the blood following an exposure of some specified amount, duration and route (usually oral). In some cases, bioavailability may be measured using chemical levels in peripheral tissues such as liver, kidney, and bone, rather than blood. The fraction or percentage absorbed may be expressed either in absolute terms (absolute bioavailability, ABA) or in relative terms (relative bioavailability, RBA). **Absolute bioavailability** is measured by comparing the amount of chemical entering the blood (or other tissue) following oral exposure to test material with the amount entering the blood (or other tissue) following intravenous exposure to an equal amount of some dissolved form of the chemical. Similarly, **relative bioavailability** is measured by comparing oral absorption of test material to oral absorption of some fully soluble form of the chemical (e.g., either the chemical dissolved in water, or a solid form that is expected to fully dissolve in the stomach). For example, if 100 ug of dissolved lead were administered in drinking water and a total of 50 ug entered the blood, the ABA would be 0.50 (50%). Likewise, if 100 ug of lead in soil were administered and 30 ug entered the blood, the ABA for soil would be 0.30 (30%). If the lead dissolved in water were used as the reference substance for describing the relative amount of lead absorbed from soil, the RBA would be 0.30/0.50 = 0.60 (60%). These values (50% absolute bioavailability of dissolved lead and 30% absolute absorption of lead in soil) are the values currently employed as defaults in EPA's IEUBK model.

It is important to recognize that simple solubility of a test material in water or some other fluid (e.g., a weak acid intended to mimic the gastric contents of a child) may not be a reliable estimator of bioavailability due to the non-equilibrium nature of the dissolution and transport processes that occur in the gastrointestinal tract (Mushak 1991). For example, transport of lead across the gut may continuously shift the equilibrium of a poorly soluble lead compound in the direction of dissolution, and stomach fluid volume and pH may undergo changes over time. However, information on the solubility of lead in different materials is useful in interpreting the importance of solubility as a determinant of bioavailability. To avoid confusion, the term "bioaccessability" is used to refer to the relative amount of lead that dissolves under a specified set of test conditions.

For additional discussion about the concept and application of bioavailability see Goodman et al. (1990), Klaassen et al. (1996), and/or Gibaldi and Perrier (1982).

Using Bioavailability Data to Improve Exposure Calculations for Lead

Data on bioavailability are important for evaluating exposure and potential health effects for a variety of different types of chemicals. This investigation focused mainly on evaluating the bioavailability of lead in various samples of soil or other solid materials from mining, milling or smelting sites. This is because lead may exist, at least in part, as poorly water soluble minerals (e.g., galena), and may also exist inside particles of inert matrix such as rock or slag of variable size, shape and association. These chemical and physical properties may tend to influence (usually decrease) the solubility (bioaccessability) and the absorption (bioavailability) of lead when ingested.

When data are available on the bioavailability of lead in soil, dust, or other soil-like waste material at a site, this information can often be used to improve the accuracy of exposure and risk calculations at that site. The basic equation for estimating the site-specific RBA of a test soil is as follows:

$$ABA_{soil} = ABA_{soluble} \cdot RBA_{soil}$$

where:

ABA_{soil} = Absolute bioavailability of lead in soil ingested by a child

$ABA_{soluble}$ = Absolute bioavailability in children of some dissolved or fully soluble form of lead

RBA_{soil} = RBA for soil measured in swine

Based on available information on lead absorption in humans and animals, the EPA estimates that the absolute bioavailability of lead from water and other fully soluble forms of lead is usually about 50% in children. Thus, when a reliable site-specific RBA value for soil is available, it may be used to estimate a site-specific absolute bioavailability as follows:

$$ABA_{soil} = 50\% \cdot RBA_{soil}$$

In the absence of site-specific data, the absolute absorption of lead from soil, dust and other similar media is estimated by EPA to be about 30%. Thus, the default RBA used by EPA for lead in soil and dust compared to lead in water is 30%/50% = 60%. When the measured RBA in soil or dust at a site is found to be less than 60% compared to some fully soluble form of lead, it may be concluded that exposures to and risks from lead in these media at that site are probably lower than typical default assumptions. If the measured RBA is higher than 60%, absorption of and risk from lead in these media may be higher than usually assumed.

2.0 STUDY DESIGN

A standardized study protocol for measuring absolute and relative bioavailability of lead was developed based upon previous study designs and investigations that characterized the young pig model (Weis et al. 1995). The study was performed as nearly as possible within the spirit and guidelines of Good Laboratory Practices (GLP: 40 CFR 792). Standard Operating Procedures (SOPs) that included detailed methods for all aspects of the study were prepared, approved, and distributed to all study members prior to the study. The generalized study design, quality assurance project plan and all standard operating procedures are documented in a project notebook that is available through the administrative record.

Three different soils from the Jasper County, Missouri, Superfund site were evaluated over the course of two different studies. Two samples (referred to as "HL Smelter" and "LL Yard") were tested concurrently in Experiment 3, and one sample (referred to as "HL Mill") was tested in the following study (Experiment 4). Both studies followed the same general design with specific details described in this section.

2.1 Test Materials

Soil samples were collected from three locations at the Jasper County, Missouri Superfund site. Each sample was a composite of four subsamples collected from four 1-foot square areas covering a 2-foot by 2-foot area at each sampling location. The depth of the soil collected was 1 to 2 inches. All samples consisted of dry, dusty leaf debris and organic soil. The samples were dried, homogenized, and sieved to a minus 60 size fraction.

Table 2-1 lists the metal content of these samples measured using standard EPA Contract Laboratory Program (CLP) methods.

Each soil was well mixed and samples were analyzed by electron microprobe in order to identify a) how frequently particles of various lead minerals were observed, b) how frequently different types of mineral particles occur entirely inside particles of rock or slag ("included") and how often they occur partially or entirely outside rock or slag particles ("liberated"), and c) approximately how much of the total amount of lead (by mass) in the sample occurs in each mineral type. This is referred to as "relative lead mass". The results are summarized in Figure 2-1 and in Table 2-2.

As seen in Panel A of Figure 2-1, the most common type of lead-bearing particle in the HL Smelter samples is slag. However, this type of particle contains a relatively low concentration of lead, and so does not account for most of the lead mass in the samples. Rather, the majority of the relative lead mass exists in the form of cerussite (lead carbonate) (about 31%), with significant contributions from native (metallic) lead (21%) and lead phosphate (20%). Cerussite is also the predominant form of lead in the LL Yard sample (Panel B, 81%) and in the HL Mill sample (Panel C, 57%).

TABLE 2-1 METAL ANALYSIS OF TEST MATERIALS

Chemical	Concentration (ppm)		
	HL Smelter	LL Yard	HL Mill
Aluminum	8,850	4,370	9,380
Antimony	4.9	BDL (1.0)	BDL (1.0)
Arsenic	25.1	10.7	16.4
Barium	284	93.7	211
Beryllium	1.7	1.0	1.4
Cadmium	33.7	188	139
Calcium	45,800	81,800	19,900
Chromium	23.8	15.2	64.6
Cobalt	19.3	6.4	34.3
Copper	93.6	144	96.0
Iron	40,200	18,000	26,600
Lead	**10,800**	**4,050**	**6,940**
Magnesium	7,860	1,390	2,280
Manganese	784	240	1270
Mercury	0.64	1.3	12.1
Nickel	44.8	30.1	110
Potassium	1,490	927	1,400
Selenium	BDL (1.0)	BDL (1.0)	BDL (1.0)
Silver	1.3	0.61	18.8
Sodium	399	403	339
Thallium	BDL (1.4)	BDL (1.8)	BDL (1.4)
Vanadium	22.5	14.8	23.0
Zinc	10,000	50,000	17,200

BDL = Below detection limit

FIGURE 2-1 LEAD MINERALS OBSERVED IN SITE SOILS

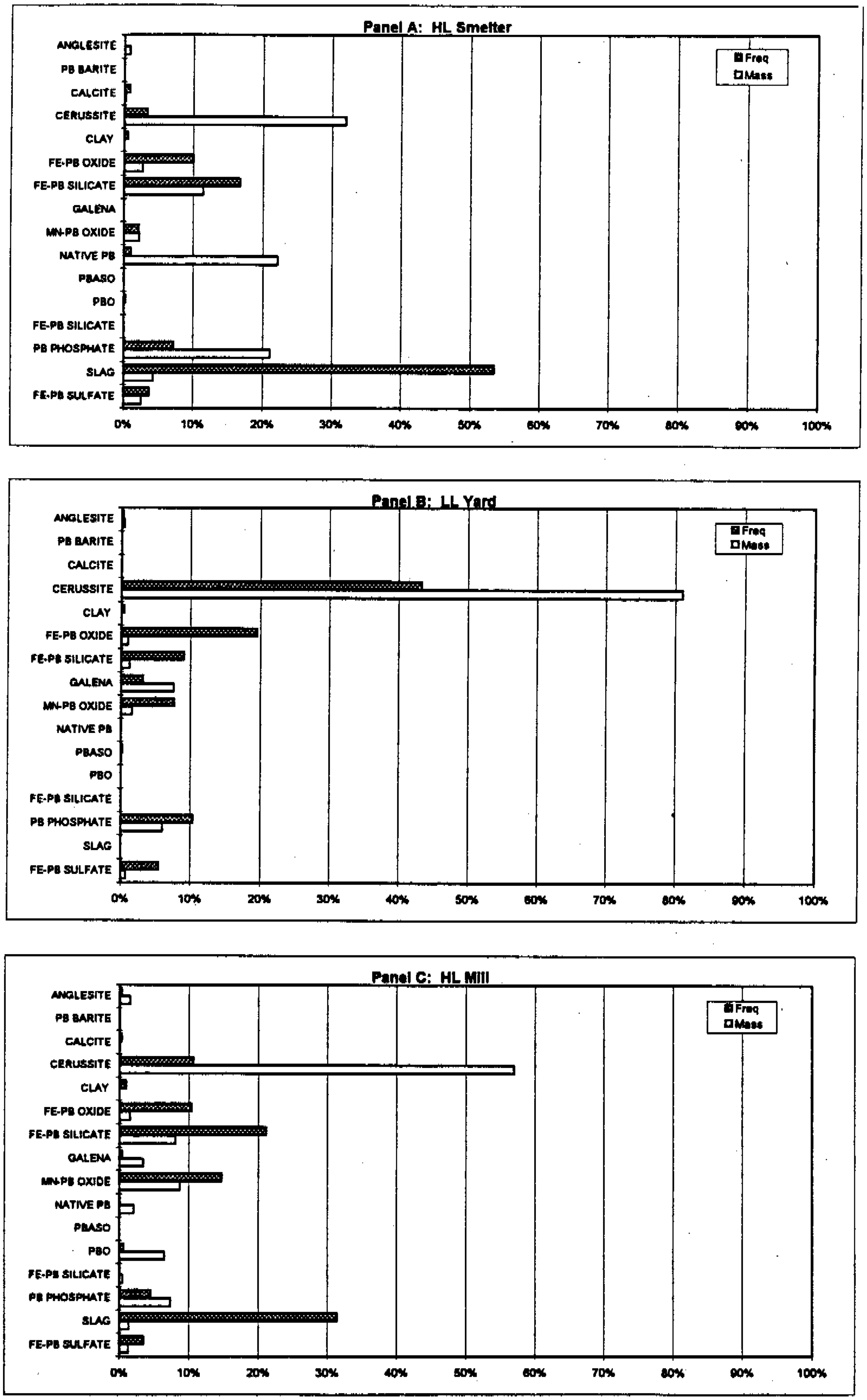


TABLE 2-2 GEOCHEMICAL CHARACTERISTICS OF TEST MATERIALS[a]

Location	Mineral Form	Particle Freq.(%)		Particle Size[d] (um)			Relative Lead Mass[e] (%)
		Count-Based[b]	Length-Weighted[c]	min	max	mean	
HL Smelter	Anglesite	0.25%	0.11%	12	12	12	0.9%
	Calcite	0.5%	0.87%	35	60	48	0.2%
	Cerussite	3.0%	3.39%	8	90	31	32.1%
	Clay	0.50%	0.64%	10	60	35	0.02%
	Fe-Pb Oxide	6.0%	10.0%	10	150	45	2.7%
	Fe-Pb Silicate	5.5%	16.8%	4	175	83	11.5%
	Mn-Pb Oxide	1.3%	2.2%	12	100	47	2.3%
	Native Lead	14.0%	1.1%	1	9	2	22.2%
	PbO	1.5%	0.31%	1	10	6	0.09%
	Lead Phosphate	29.3%	7.3%	1	90	7	21.1%
	Slag	15.5%	53.6%	15	300	94	4.3%
	Fe-Pb Sulfate	22.6%	3.8%	1	10	5	2.6%
LL Yard	Anglesite	1.6%	0.31%	2	6	3	0.48%
	Cerussite	52.2%	43.4%	1	130	15	81%
	Clay	0.5%	0.46%	15	15	15	0.003%
	Fe-Pb Oxide	9.9%	19.5%	8	100	36	1.1%
	Fe-Pb Silicate	4.9%	9.1%	5	100	33	1.2%
	Galena	1.1%	3.2%	25	80	53	7.6%
	Mn-Pb Oxide	5.5%	7.7%	8	55	25	1.6%
	PbAsO	1.1%	0.28%	1	8	5	0.17%
	PbSiO4	1.1%	0.09%	1	2	2	0.04%
	Lead Phosphate	17.6%	10.4%	1	80	11	6.0%
	Fe-Pb Sulfate	4.9%	5.5%	1	100	20	0.75%
HL Mill	Anglesite	0.36%	0.36%	25	25	25	1.6%
	Lead Barite	0.36%	0.04%	3	3	3	0.01%
	Calcite	0.36%	0.36%	25	25	25	0.1%
	Cerussite	32.0%	10.7%	1	70	8	57.0%
	Clay	1.1%	1.0%	8	40	24	0.02%
	Fe-Pb Oxide	11.7%	10.4%	3	110	22	1.6%
	Fe-Pb Silicate	14.6%	21.2%	1	210	36	8.1%
	Galena	2.1%	0.51%	1	30	6	3.4%
	Mn-Pb Oxide	13.9%	14.8%	3	125	27	8.7%
	Native Lead	1.1%	0.18%	1	10	4	2.2%
	PbO	1.1%	0.71%	5	40	17	6.5%
	PbSiO4	0.36%	0.14%	10	10	10	0.53%
	Lead Phosphate	5.3%	4.5%	2	100	21	7.4%
	Slag	8.5%	31.5%	15	210	92	1.4%
	Fe-Pb Sulfate	7.1%	3.6%	3	60	13	1.4%

[a] Samples were analyzed using an electron microprobe (JEOL 8600) to identify the number of particles of each lead species present in each sample and the particle size (largest dimension) of each particle.
[b] Percentage of all lead-bearing particles of the mineral form shown
[c] Percentage of total length of all lead particles consisting of mineral form shown
[d] Based on longest dimension of each particle
[e] Rough estimate of the percent of the total mass of lead present in each mineral form

Figure 2-2 shows the distribution of the size of lead-bearing particles in each sample. As seen, most of the lead particles present in the three samples were less than 50 um in diameter. As noted above, small particles are often assumed to be more likely to adhere to the hands and be ingested and/or be transported into the house. Further, small particles have larger surface area-to-volume ratios than larger particles, and so may tend to dissolve more rapidly in the acidic contents of the stomach than larger particles. Thus, small particles (e.g., less than 25-50 um) are thought to be of greater potential concern to humans than larger particles (e.g., 100-250 um or larger).

Another property of lead particles that may be important in determining bioaccessability and/or bioavailability is the degree to which they are partially or entirely free from surrounding matrix ("liberated"). In the HL Smelter sample, nearly 81% of the lead-bearing particles are liberated, accounting for about 73% of the relative lead mass. In the LL Yard sample, essentially 100% of the lead-bearing particles are liberated, and about 96% are liberated in the HL Mill sample. These high percentages of partially or entirely liberated grains may tend to increase the bioavailability of lead in these samples.

2.2 Experimental Animals

Young swine were selected for use in these studies because they are considered to be a good physiological model for gastrointestinal absorption in children (Weis and LaVelle 1991). The animals were intact males of the Pig Improvement Corporation (PIC) genetically defined Line 26, and were purchased from Chinn Farms, Clarence, MO. The animals were held under quarantine to observe their health for one week before beginning exposure to test materials. To minimize weight variations between animals and groups, the number of animals purchased from the supplier was six more than needed for the study, and the six animals most different in body weight on day -4 (either heavier or lighter) were excluded from further study. The remaining animals were assigned to dose groups at random. When exposure began (day zero), the animals were about 5-6 weeks old (juveniles, weaned at 3 weeks) and weighed an average of about 10 kg for both experiment 3 and 4. Animals were weighed every three days during the course of the studies. The group mean body weights over the course of the studies are shown in Figure 2-3. As seen, on average, animals gained about 0.4 to 0.5 kg/day, and the rate of weight gain was comparable in most groups, although the animals in group 10 (intravenous exposure) in Experiment 4 appeared to gain weight more slowly that most.

All animals were housed in individual lead-free stainless steel cages. Each animal was examined by a certified veterinary clinician (swine specialist) prior to being placed on study, and all animals were examined daily by an attending veterinarian while on study. Any animal that displayed significant signs of illness was given appropriate treatment, and was removed from study if the illness could not be promptly controlled. Blood samples were collected for clinical chemistry and hematological analysis on days -4, 7, and 15 to assist in clinical health

FIGURE 2-2 PARTICLE SIZE DISTRIBUTION

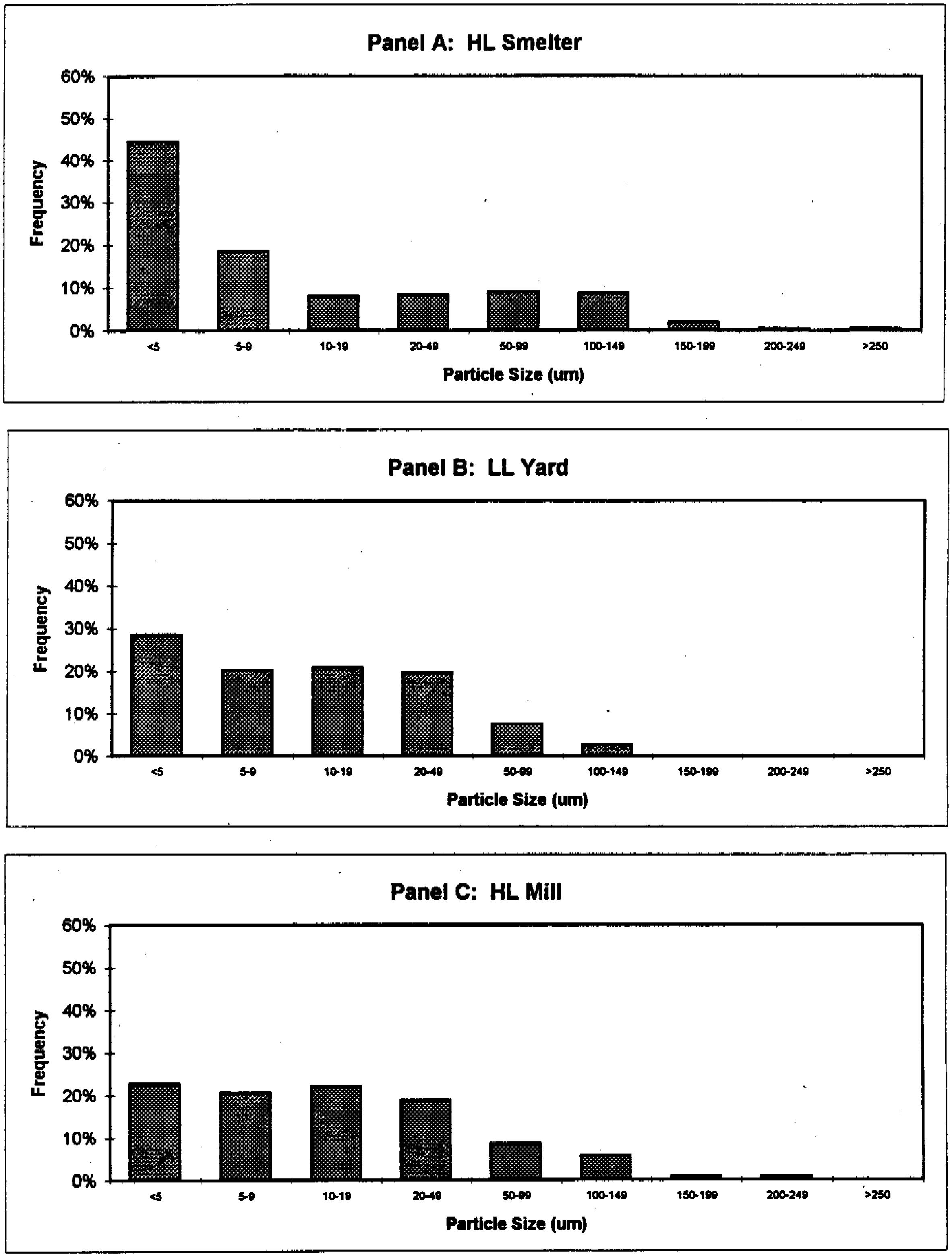
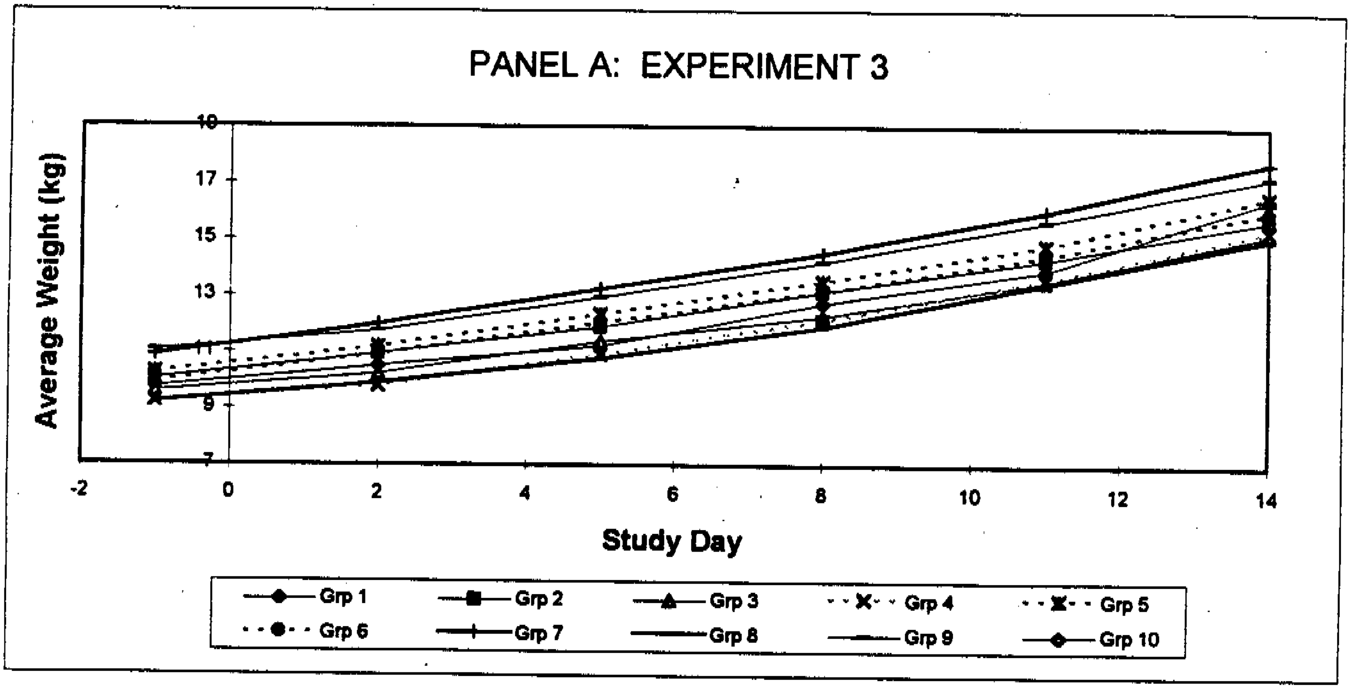
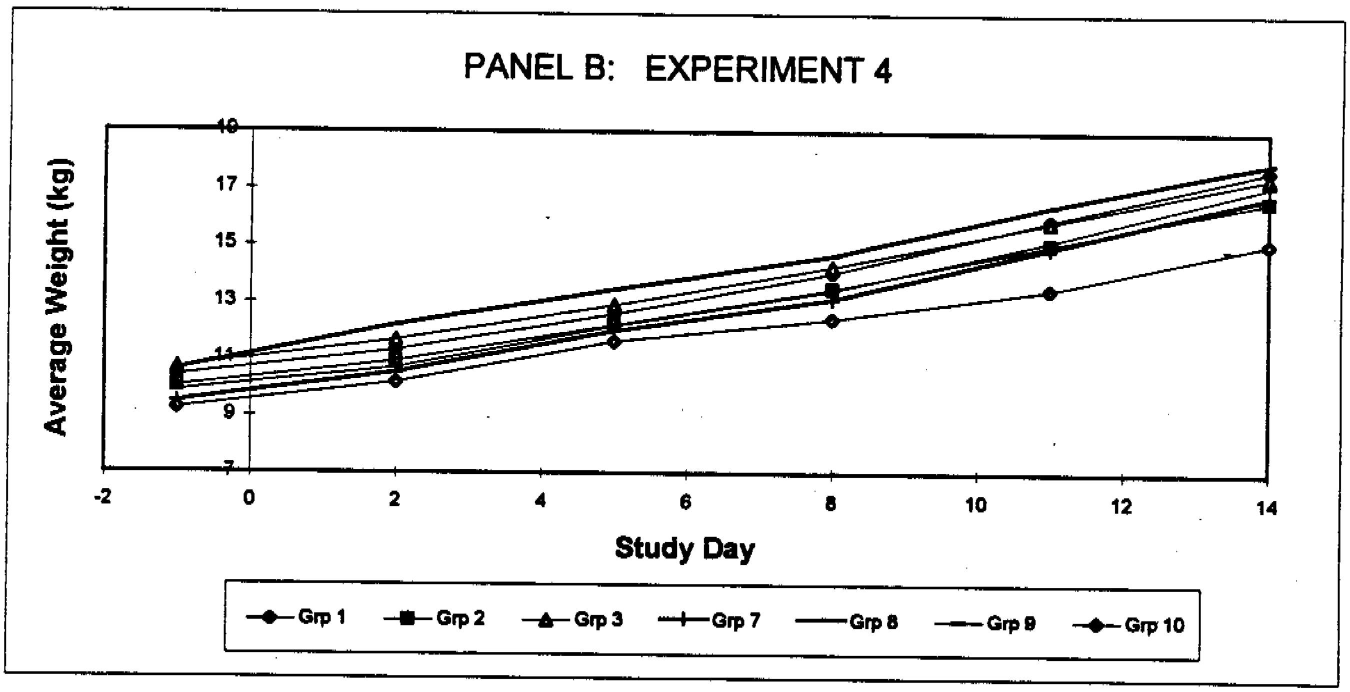


FIGURE 2-3 BODY WEIGHTS OF TEST ANIMALS





assessments. Due to infections around the indwelling catheters in pigs from the IV dosing groups, one pig from experiment 3 and five pigs from experiment 4 were removed from the study.

2.3 Diet

Animals provided by the supplier were weaned onto standard pig chow purchased from MFA Inc., Columbia, MO. In order to minimize lead exposure from the diet, the animals were gradually transitioned from the MFA feed to a special low-lead feed (guaranteed less than 0.2 ppm lead, purchased from Zeigler Brothers, Inc., Gardners, PA) over the time interval from day -7 to day -3, and this feed was then maintained for the duration of the study. The feed was nutritionally complete and met all requirements of the National Institutes of Health-National Research Council. The typical nutritional components and chemical analysis of the feed is presented in Table 2-3. Typically, the feed contained approximately 5.7% moisture, 1.7% fiber,and provided about 3.4 kcal of metabolizable energy per gram. Periodic analysis of feed samples during this program indicated the mean lead level (treating non-detects at one-half the quantitation limit of 0.05 ppm) was less than 0.05 ppm.

Each day every animal was given an amount of feed equal to 5% of the mean body weight of all animals on study. Feed was administered in two equal portions of 2.5% of the mean body weight at each feeding. Feed was provided at 11:00 AM and 5:00 PM daily. Drinking water was provided ad libitum via self-activated watering nozzles within each cage. Periodic analysis of samples from randomly selected drinking water nozzles indicated the mean lead concentration (treating non-detects at one-half the quantitation limit) was less than 2 ug/L.

2.4 Dosing

The protocols for exposing animals to lead in Experiments 3 and 4 are shown in Table 2-4. The dose levels for lead acetate were based on experience from previous investigations that showed that doses of 75-225 ug Pb/kg/day gave clear and measurable increases in lead levels in all endpoints measured (blood, liver, kidney, bone). The doses of test materials were set at the same level as lead acetate, with one higher dose (675 ug Pb/kg-day) included in case the test materials were found to yield very low responses.

Animals were exposed to lead for 15 days, with the dose for each day being administered in two equal portions given at 9:00 AM and 3:00 PM (two hours before feeding). Doses were based on measured group mean body weights, and were adjusted every three days to account for animal growth. For animals exposed by the oral route, dose material was placed in the center of a small portion (about 5 grams) of moistened feed, and this was administered to the animals by hand. Most animals consumed the dose promptly, but occasionally some animals delayed ingestion of the dose for up to two hours (the time the daily feed portion was provided). These delays are noted in the data provided in Appendix A, but are not considered to be a significant source of error. Occasionally, some animals did not consume some or all of the dose (usually because the dose dropped from their mouth while chewing). All missed doses were recorded

TABLE 2-3 TYPICAL FEED COMPOSITION[a]

Nutrient Name	Amount	Nutrient Name	Amount
Protein	20.1021%	Chlorine	0.1911%
Arginine	1.2070%	Magnesium	0.0533%
Lysine	1.4690%	Sulfur	0.0339%
Methionine	0.8370%	Manganese	20.4719 ppm
Met+Cys	0.5876%	Zinc	118.0608 ppm
Tryptophan	0.2770%	Iron	135.3710 ppm
Histidine	0.5580%	Copper	8.1062 ppm
Leucine	1.8160%	Cobalt	0.0110 ppm
Isoleucine	1.1310%	Iodine	0.2075 ppm
Phenylalanine	1.1050%	Selenium	0.3196 ppm
Phe+Tyr	2.0500%	Nitrogen Free Extract	60.2340%
Threonine	0.8200%	Vitamin A	5.1892 kIU/kg
Valine	1.1910%	Vitamin D3	0.6486 kIU/kg
Fat	4.4440%	Vitamin E	87.2080 IU/kg
Saturated Fat	0.5590%	Vitamin K	0.9089 ppm
Unsaturated Fat	3.7410%	Thiamine	9.1681 ppm
Linoleic 18:2:6	1.9350%	Riboflavin	10.2290 ppm
Linoleic 18:3:3	0.0430%	Niacin	30.1147 ppm
Crude Fiber	3.8035%	Pantothenic Acid	19.1250 ppm
Ash	4.3347%	Choline	1019.8600 ppm
Calcium	0.8675%	Pyridoxine	8.2302 ppm
Phos Total	0.7736%	Folacin	2.0476 ppm
Available Phosphorous	0.7005%	Biotin	0.2038 ppm
Sodium	0.2448%	Vitamin B12	23.4416 ppm
Potassium	0.3733%		

[a] Nutritional values provided by Zeigler Bros., Inc.

TABLE 2-4 DOSING PROTOCOLS

EXPERIMENT 3

Group	Number of Animals	Dose Material Administered	Exposure Route	Lead Dose (ug Pb/kg-d)	
				Target	Actual[a]
1	2	None	Oral	0	0
2	5	Lead Acetate	Oral	75	75.9
3	5	Lead Acetate	Oral	225	247
4	5	HL Smelter	Oral	75	76.8
5	5	HL Smelter	Oral	225	227
6	5	HL Smelter	Oral	675	742
7	5	LL Yard	Oral	75	75
8	5	LL Yard	Oral	225	231
9	5	LL Yard	Oral	675	686
10	5	Lead Acetate	Intravenous	100	102

EXPERIMENT 4

Group	Number of Animals	Dose Material Administered	Exposure Route	Lead Dose (ug Pb/kg-d)	
				Target	Actual[a]
1	2	None	Oral	0	0
2	5	Lead Acetate	Oral	75	76.5
3	5	Lead Acetate	Oral	225	216
7	5	HL Mill	Oral	75	77.1
8	5	HL Mill	Oral	225	227
9	5	HL Mill	Oral	675	688
10	8	Lead Acetate	Intravenous	100	101

Doses were administered in two equal portions given at 9:00 AM and 3:00 PM each day. Doses were based on the mean weight of the animals in each group, and were adjusted every three days to account for weight gain.

[a] Calculated as the administered daily dose divided by the measured or extrapolated daily body weight, averaged over days 0-14 for each animal and each group.

and the time-weighted average dose calculation for each animal was adjusted downward accordingly.

For animals exposed by intravenous injection, doses were given via a vascular access port (VAP) attached to an indwelling venous catheter that had been surgically implanted according to standard operating procedures by a board-certified veterinary surgeon through the external jugular vein to the cranial vena cava about 3 to 5 days before exposure began.

Actual mean doses, calculated from the administered doses and the measured body weights, are also shown in Table 2-4.

2.5 Collection of Biological Samples

Blood

Samples of blood were collected from each animal four days before exposure began (day -4), on the first day of exposure (day 0), and on days 1, 2, 3, 5, 7, 9, 12, and 15 following the start of exposure. All blood samples were collected by vena-puncture of the anterior vena cava, and samples were immediately placed in purple-top Vacutainer® tubes containing EDTA as anticoagulant. Blood samples were collected each sampling day beginning at 8:00 AM, approximately one hour before the first of the two daily exposures to lead on the sampling day and 17 hours after the last lead exposure the previous day. This blood collection time was selected because the rate of change in blood lead resulting from the preceding exposures is expected to be relatively small after this interval (LaVelle et al. 1991, Weis et al. 1993), so the exact timing of sample collection relative to last dosing is not likely to be critical.

Following collection of the final blood sample at 8:00 AM on day 15, all animals were humanely euthanized and samples of liver, kidney and bone (the right femur) were removed and stored in lead-free plastic bags for lead analysis. Samples of all biological samples collected were archived in order to allow for later reanalysis and verification, if needed. All animals were also subjected to detailed examination at necropsy by a certified veterinary pathologist in order to assess overall animal health.

2.6 Preparation of Biological Samples for Analysis

Blood

One mL of whole blood was removed from the purple-top Vacutainer and added to 9.0 mL of "matrix modifier", a solution recommended by the Centers for Disease Control and Prevention (CDCP) for analysis of blood samples for lead. The composition of matrix modifier is 0.2% (v/v) ultrapure nitric acid, 0.5% (v/v) Triton X-100, and 0.2% (w/v) dibasic ammonium phosphate in deionized and ultrafiltered water. Samples of the matrix modifier were routinely analyzed for lead to ensure the absence of lead contamination.

Liver and Kidney

One gram of soft tissue (liver or kidney) was placed in a lead-free screw-cap teflon container with 2 mL of concentrated (70%) nitric acid and heated in an oven to 90°C overnight. After cooling, the digestate was transferred to a clean lead-free 10 mL volumetric flask and diluted to volume with deionized and ultrafiltered water.

Bone

The right femur of each animal was removed and defleshed, and dried at 100°C overnight. The dried bones were then placed in a muffle furnace and dry-ashed at 450°C for 48 hours. Following dry ashing, the bone was ground to a fine powder using a lead-free mortar and pestle, and 200 mg was removed and dissolved in 10.0 mL of 1:1 (v:v) concentrated nitric acid:water. After the powdered bone was dissolved and mixed, 1.0 mL of the acid solution was removed and diluted to 10.0 mL by addition of 0.1% (w/v) lanthanum oxide (La_2O_3) in deionized and ultrafiltered water.

2.7 Lead Analysis

Samples of biological tissue (blood, liver, kidney, bone) and other materials (food, water, reagents and solutions, etc.) were arranged in a random sequence and provided to EPA's analytical laboratory in a blind fashion (identified to the laboratory only by a chain of custody tag number). Each sample was analyzed for lead using a Perkin Elmer Model 5100 graphite furnace atomic absorption spectrophotometer. Internal quality assurance samples were run every tenth sample, and the instrument was recalibrated every 15th sample. A blank, duplicate and spiked sample were run every 20th sample.

All results from the analytical laboratory were reported in units of ug Pb/L of prepared sample. The quantitation limit was defined as three-times the standard deviation of a set of seven replicates of a low-lead sample (typically about 2-5 ug/L). The standard deviation was usually about 0.3 ug/L, so the quantitation limit was usually about 0.9-1.0 ug/L (ppb). For prepared blood samples (diluted 1/10), this corresponds to a quantitation limit of 10 ug/L (1 ug/dL). For soft tissues (liver and kidney, diluted 1/10), this corresponds to a quantitation limit of 10 ug/kg (ppb) wet weight, and for bone (final dilution = 1/500) the corresponding quantitation limit is 0.5 ug/g (ppm) ashed weight.

3.0 DATA ANALYSIS

3.1 Overview

Studies on the absorption of lead are often complicated because some biological responses to lead exposure may be non-linear functions of dose (i.e., tending to flatten out or plateau as dose increases). The cause of this non-linearity is uncertain but might be due either to non-linear **absorption kinetics** and/or to non-linear **biological response** per unit dose absorbed. When the dose-response curve for either the reference material (lead acetate) and/or the test material is non-linear, RBA is equal to the ratio of doses that produce equal responses (not the ratio of responses at equal doses). This is based on the simple but biologically plausible assumption that equal absorbed doses yield equal biological responses. Applying this assumption leads to the following general methods for calculating RBA from a set of non-linear experimental data:

1. Plot the biological responses of individual animals exposed to a series of oral doses of soluble lead (e.g., lead acetate). Fit an equation which gives a smooth line through the observed data points.

2. Plot the biological responses of individual animals exposed to a series of doses of test material. Fit an equation which gives a smooth line through the observed data.

3. Using the best fit equations for reference material and test material, calculate RBA as the ratios of doses of test material and reference material which yield equal biological responses. Depending on the relative shape of the best-fit lines through the lead acetate and test material dose response curves, RBA may either be constant (dose-independent) or variable (dose-dependent).

The principal advantage of this approach is that it is not necessary to understand the basis for a non-linear dose response curve (non-linear absorption and/or non-linear biological response) in order to derive valid RBA estimates. Also, it is important to realize that this method is very general, as it will yield correct results even if one or both of the dose-response curves are linear. In the case where both curves are linear, RBA is dose-independent and is simply equal to the ratio of the slopes of the best-fit linear equations.

3.2 Fitting the Curves

There are a number of different mathematical equations which can yield reasonable fits with the dose-response data sets obtained in this study. In selecting which equations to employ, the following principles were applied: 1) mathematically simple equations were preferred over mathematically complex equations, 2) the shape of the curves had to be smooth and biologically realistic, without inflection points, maxima or minima, and 3) the general form of the equations had to be able to fit data not only from this one study, but from all the studies that are part of this project. After testing a wide variety of different equations, it was found that all data sets could be well fitted using one of the following three forms:

Linear (LIN): $\text{Response} = a + b \cdot \text{Dose}$

Exponential (EXP): $\text{Response} = a + c \cdot (1\text{-}\exp(\text{-}d \cdot \text{Dose}))$

Combination (LIN+EXP): $\text{Response} = a + b \cdot \text{Dose} + c \cdot (1\text{-}\exp(\text{-}d \cdot \text{Dose}))$

Although underlying mechanism was not considered in selecting these equations, the linear equation allows fitting data that do not show evidence of saturation in either uptake or response, while the exponential and mixed equations allow evaluation of data that appear to reflect some degree of saturation in uptake and/or response.

Each dose-response data set was fit to each of the equations above. If one equation yielded a fit that was clearly superior (as judged by the value of the adjusted correlation coefficient R^2) to the others, that equation was selected. If two or more models fit the data approximately equally well, then the simplest model (that with the fewest parameters) was selected. In the process of finding the best-fits of these equations to the data, the values of the parameters (a, b, c, and d) were subjected to some constraints, and some data points (those that were outside the 95% prediction limits of the fit) were excluded. These constraints and outlier exclusion steps are detailed in Appendix A (Section 3). In general, most blood lead AUC dose-response curves were best fit by the exponential equation, and most dose-response curves for liver, kidney and bone were best fit by linear equations.

3.3 Responses Below Quantitation Limit

In some cases, most or all of the responses in a group of animals were below the quantitation limit for the endpoint being measured. For example, this was normally the case for blood lead values in unexposed animals (both on day -4 and day 0, and in control animals), and also occurred during the early days in the study for animals given test materials with low bioavailability. In these cases, all animals which yielded responses below the quantitation limit were evaluated as if they had responded at one-half the quantitation limit.

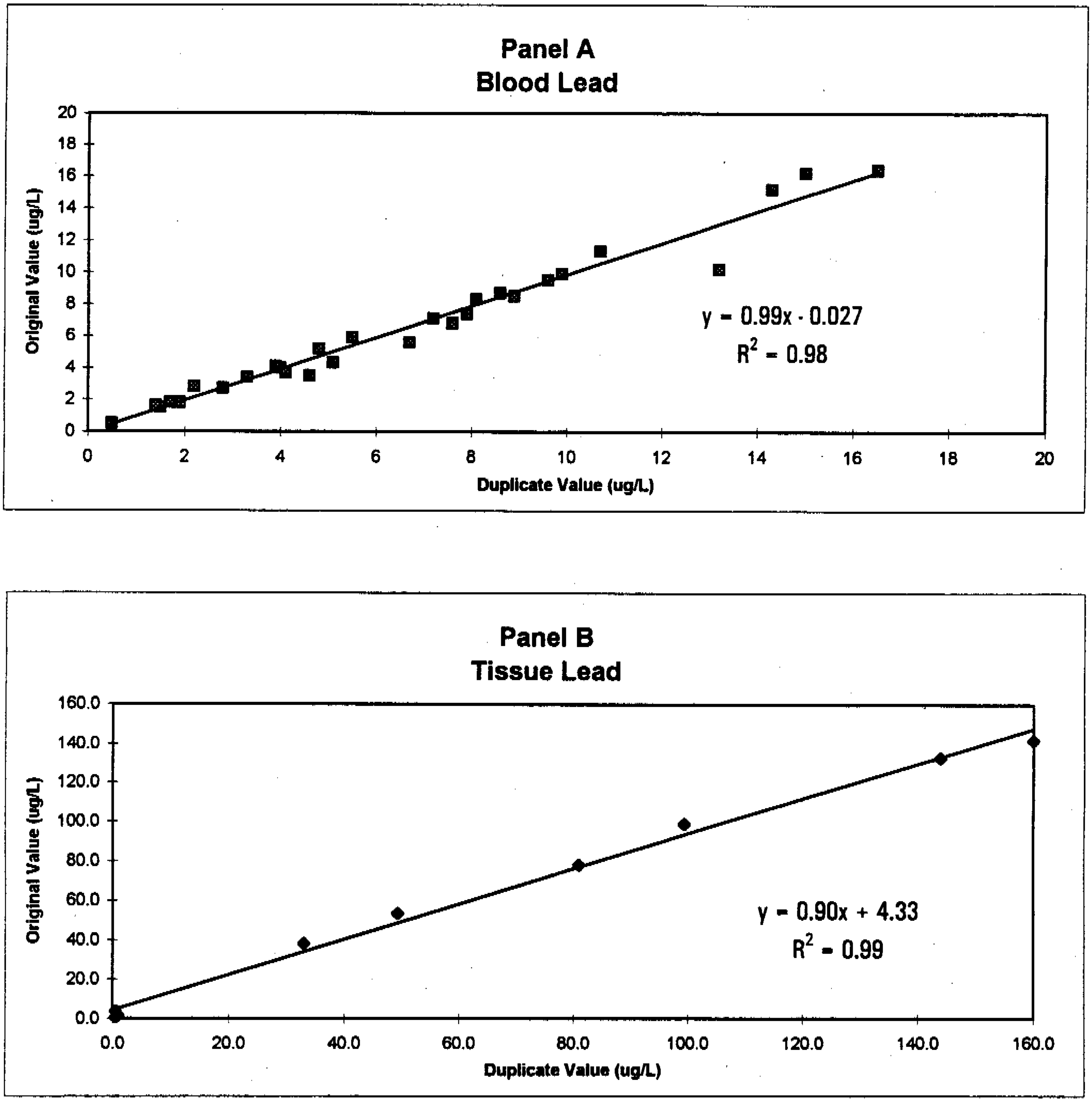
3.4 Quality Assurance

A number of steps were taken throughout this study and the other studies in this project to ensure the quality of the results. These steps are summarized below.

Duplicates

A randomly selected set of about 5% of all samples generated during the studies were submitted to the laboratory in a blind fashion for duplicate analysis. The raw data for each study are presented in Appendix A. Figure 3-1 plots the results (combined across studies 3 and 4) for

FIGURE 3-1 COMPARISION OF DUPLICATE ANALYSES



Blind random duplicates submitted at a 5% rate to EPA laboratories to provide a meaure of analytical precision (reproducibility) blood (Panel A, upper) and for bone, liver and kidney (Panel B, lower). As seen, there was good intra-laboratory reproducibility between duplicate samples for both blood and tissues, with linear regression lines having a slope near 1.0, an intercept near zero, and an R^2 value near 1.0.

Standards

The Centers for Disease Control and Prevention (CDCP) provides a variety of blood lead "check samples" for use in quality assurance programs for blood lead studies. Each time a group of blood samples was prepared and sent to the laboratory for analysis, several CDCP check samples of different concentrations were included in random order and in a blind fashion.

The results for the samples submitted during experiments 3 and 4 are presented separately in Appendix A, and the combined values are plotted in Panel A of Figure 3-2. As seen, the analytical results obtained for the check samples tended to be low for the "low", "medium", and "high" standards employed (nominal concentrations = 1.7 ug/dL, 4.8 ug/dL, and 14.9 ug/dL).

Interlaboratory Comparison

An interlaboratory comparison of blood lead analytical results was performed by sending a set of 20 randomly selected whole blood samples from each study to CDCP for blind independent analysis. The results are presented in Appendix A, and the combined values are plotted in Panel B (lower) of Figure 3-2. As seen, the results of analyses by EPA's laboratory tended to be about 15% lower than the values measured by CDCP.

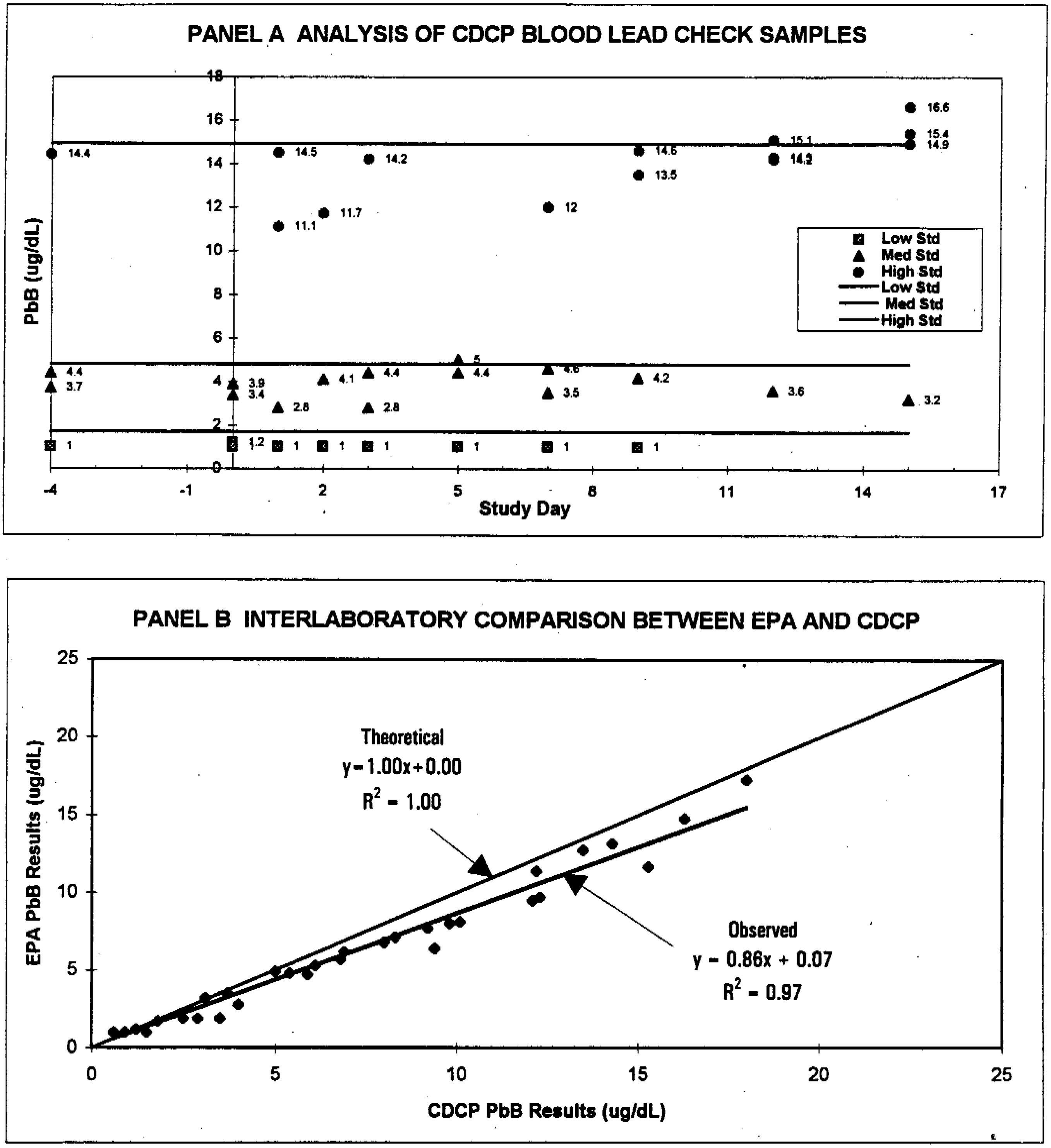
The reason for this apparent discrepancy between the EPA laboratory and the CDCP laboratory is not clear, but might be related to differences in sample preparation techniques. Regardless of the reason, the differences are sufficiently small that they are likely to have no significant effect on calculated RBA values. In particular, it is important to realize that if both the lead acetate and test soils dose-response curves are biased by the same factor, then the biases cancel in the calculation of the ratio.

Data Audits and Spreadsheet Validation

All analytical data generated by EPA's analytical laboratory were validated prior to being released in the form of a database file. These electronic data files were "decoded" (linking the sample tag to the correct animal and day) using Microsoft's database system ACCESS® (Version 5 for Windows). To ensure that no errors occurred in this process, original downloaded electronic files were printed out and compared to printouts of the tag assignments and the decoded data.

All spreadsheets used to manipulate the data and to perform calculations (see Appendix A) were validated by hand-checking random cells for accuracy.

FIGURE 3-2 CDCP CHECK SAMPLES AND INTERLABORATORY COMPARISON



4.0 RESULTS

The following sections provide results based on the group means for each dose group investigated in this study. Appendix A provides detailed data for each individual animal. Results from this study will be compared and contrasted with the results from other studies in a subsequent report.

4.1 Blood Lead vs Time

Figure 4-1 (Panels A, B, and C) show the group mean blood lead values as a function of time in animals exposed to each of the test materials. Each panel also shows the response of animals exposed to lead acetate in the corresponding study. As seen, blood lead values began at or below quantitation limits (about 1 ug/dL) in all groups, and remained at or below quantitation limits in control animals (Group 1). In animals given repeated oral doses of lead acetate (Groups 2 and 3), HL Smelter soil (Groups 4-6, Panel A), LL Yard soil (Groups 7-9, Panel B), or HL Mill soil (Groups 7-9, Panel C), blood levels began to rise within 1-2 days, and tended to plateau by the end of the study (day 15). A similar pattern was observed in animals exposed to lead acetate by intravenous injection (Group 10).

4.2 Dose-Response Patterns

Blood Lead

The measurement endpoint used to quantify the blood lead response was the area under the curve (AUC) for blood lead vs time (days 0-15). AUC was selected because it is the standard pharmacokinetic index of chemical uptake into the blood compartment, and is relatively insensitive to small variations in blood lead level by day. The AUC for each animal was calculated using the trapezoidal rule to estimate the AUC between each time point that a blood lead value was measured (days 0, 1, 2, 3, 5, 7, 9, 12, and 15), and summing the areas across all time intervals in the study. The detailed data and calculations are presented in Appendix A, and the results are shown graphically in Figure 4-2. Each data point reflects the group mean exposure and group mean response, with the variability in dose and response shown by standard error bars. The figures also show the best-fit equation through each data set.

As seen, the dose response pattern is non-linear for both the soluble reference material (lead acetate, abbreviated "PbAc"), and for each of the three test soils. The dose response curve for both the LL Yard and HL Mill soils are similar to that for lead acetate, while the curve for the HL Smelter soil is somewhat lower.

Tissue Lead

The dose-response data for lead levels in bone, liver and kidney (measured at sacrifice on day 15) are detailed in Appendix A, and are shown graphically in Figures 4-3 through 4-5.

FIGURE 4 -1 BLOOD LEAD BY DAY

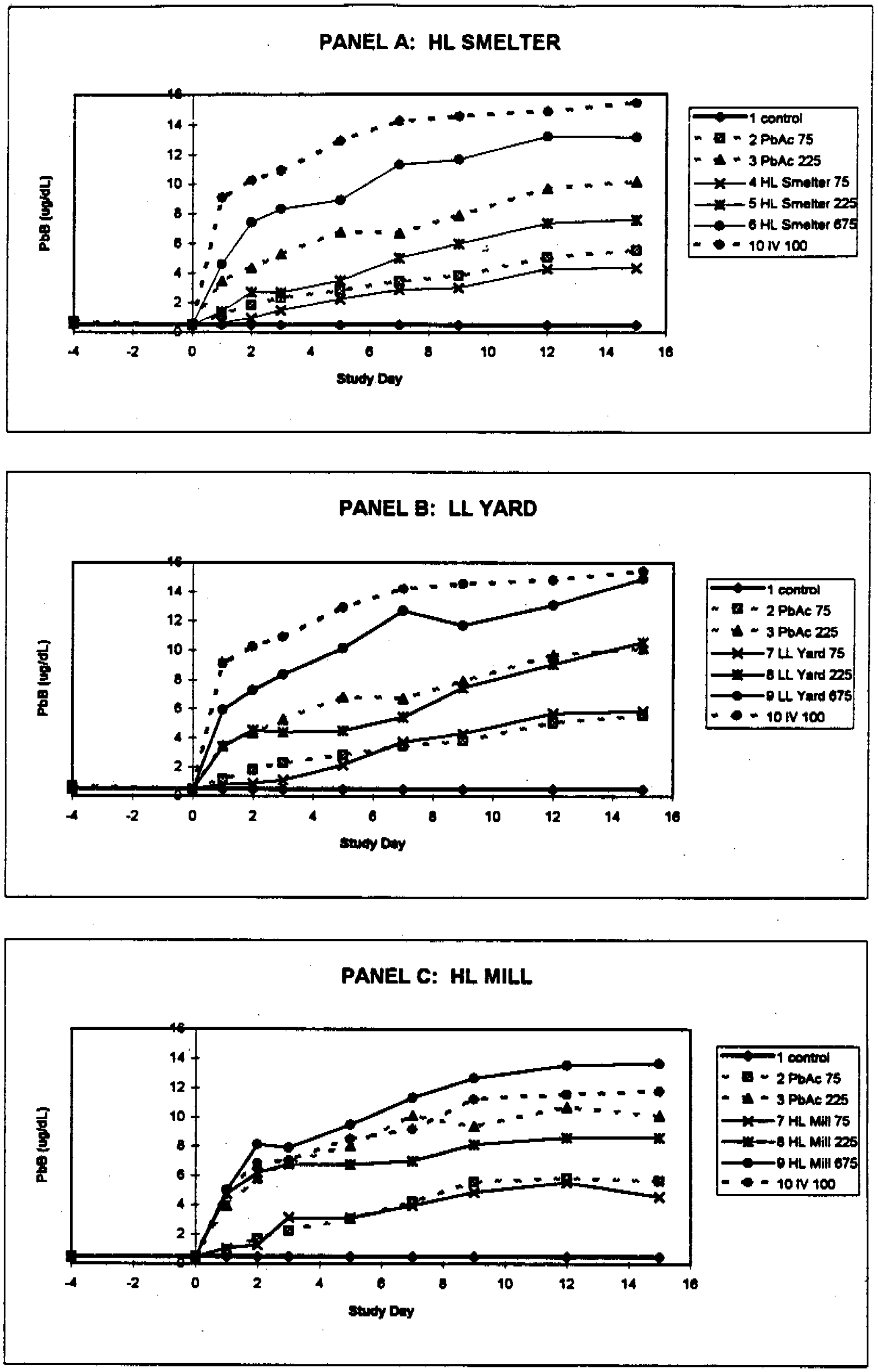


FIGURE 4-2 BLOOD LEAD AUC DOSE-RESPONSE CURVES FOR JASPER COUNTY SOILS

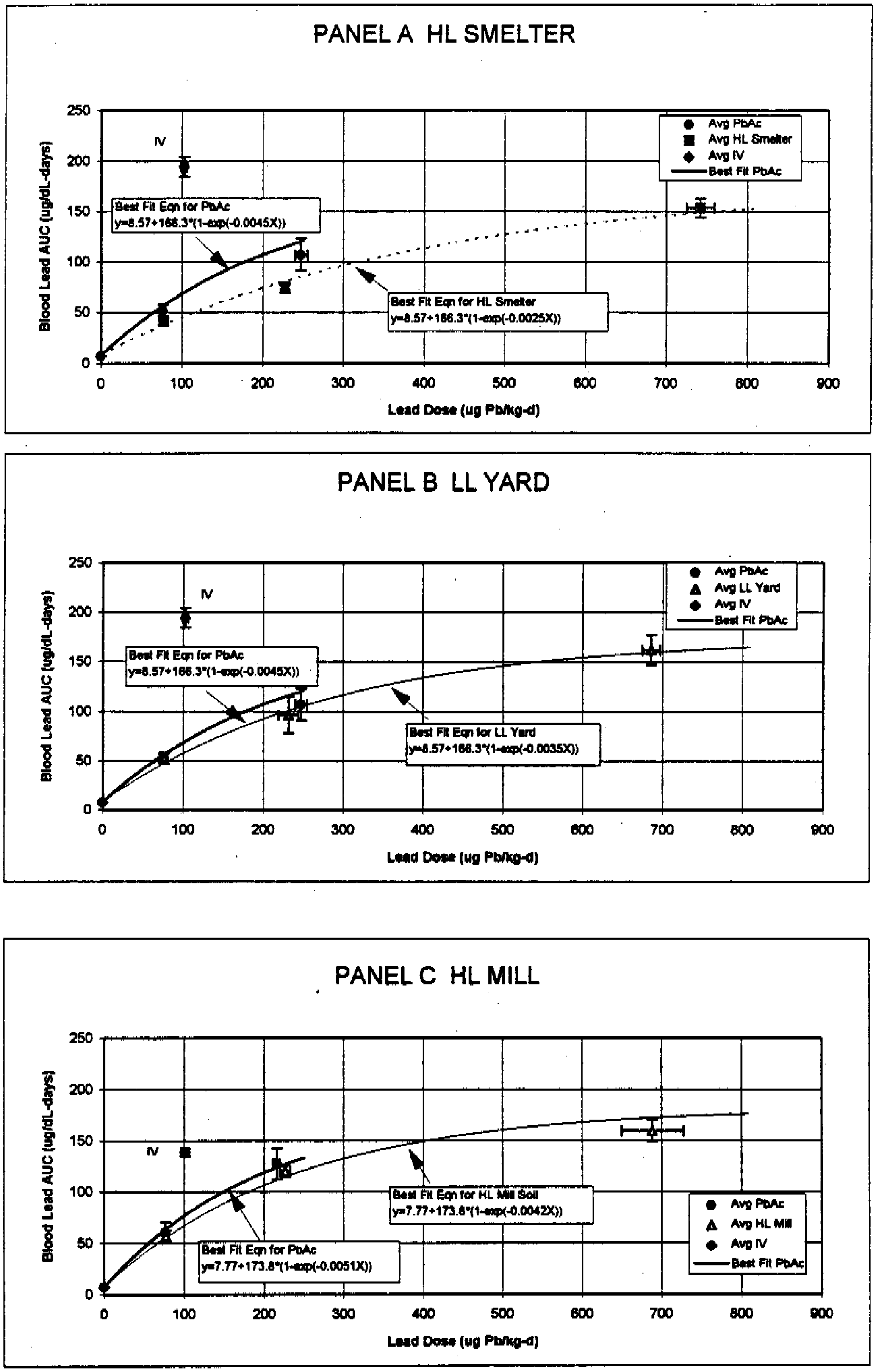


FIGURE 4-3 BONE LEAD DOSE-RESPONSE CURVES FOR JASPER COUNTY SOILS

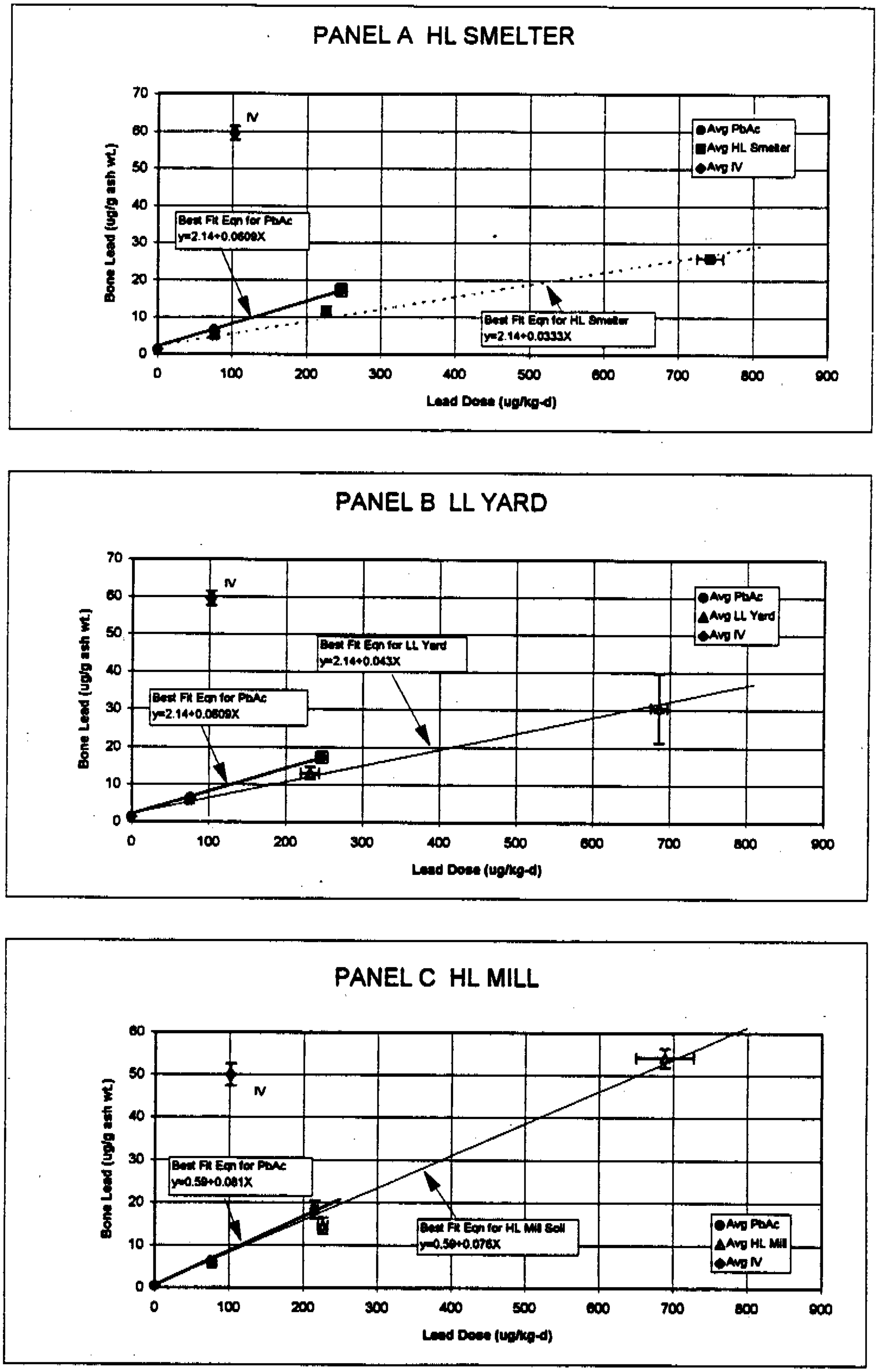


FIGURE 4-4 LIVER LEAD DOSE-RESPONSE CURVES FOR JASPER COUNTY SOILS

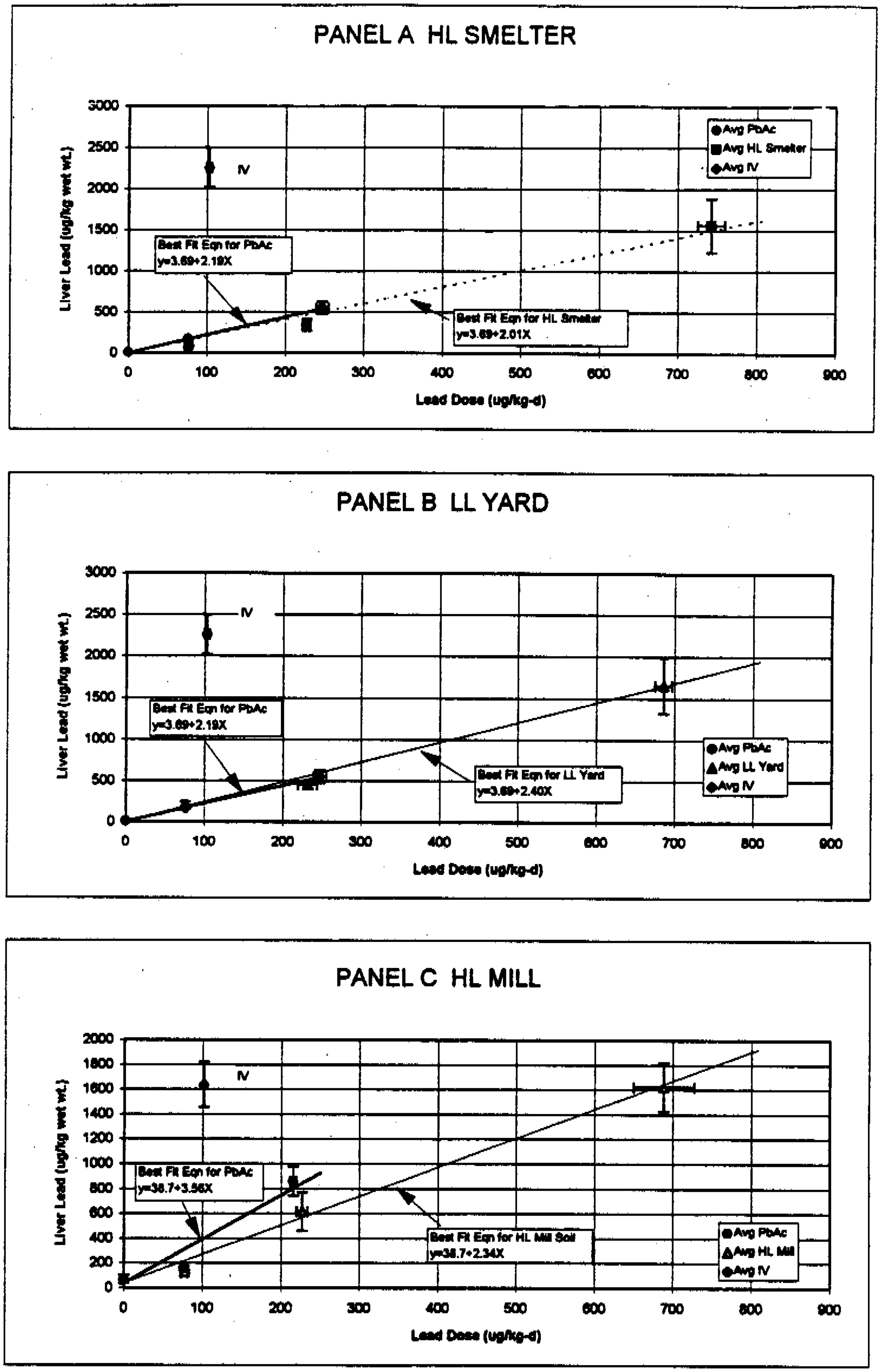
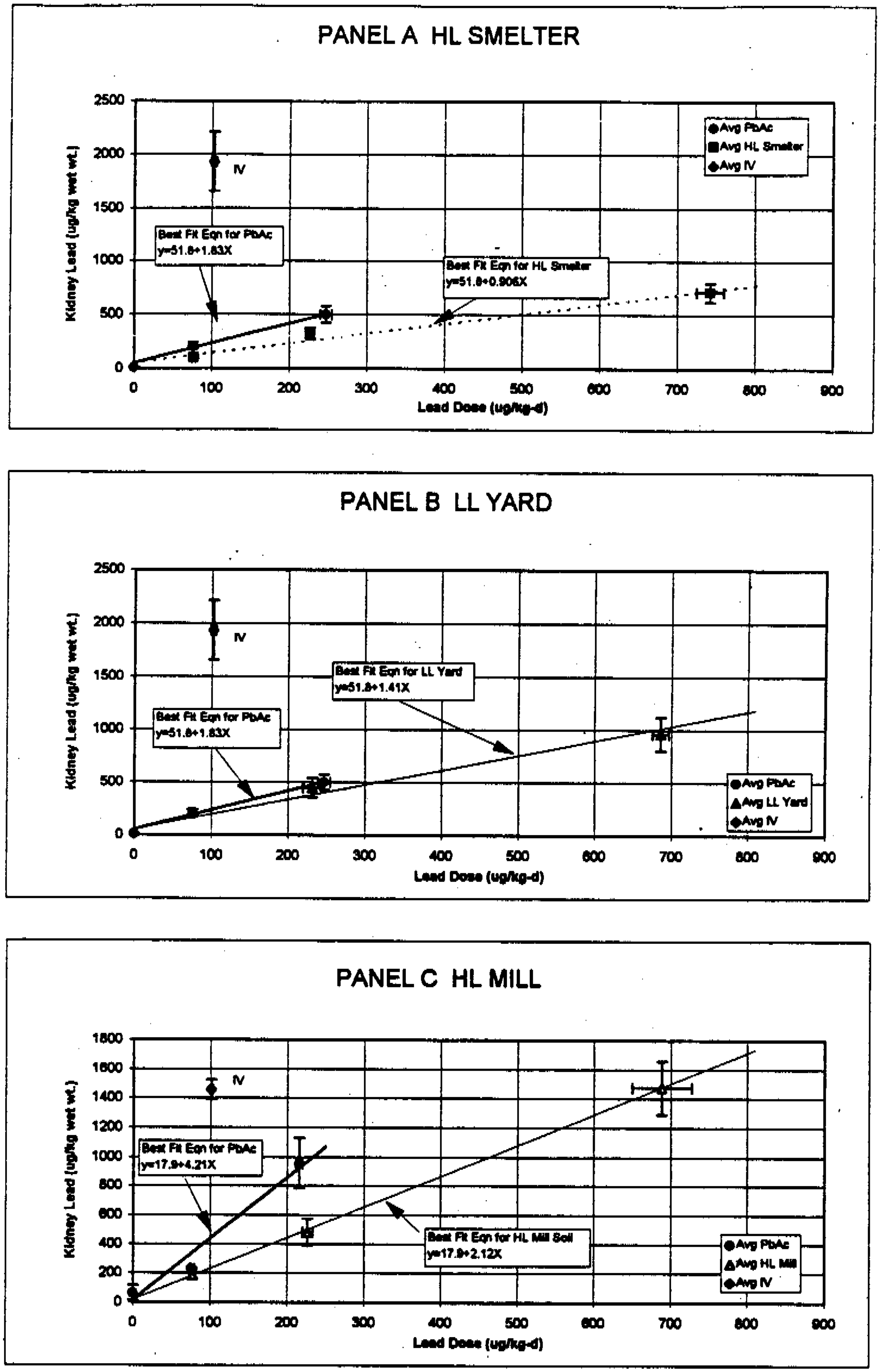


FIGURE 4-5 KIDNEY LEAD DOSE-RESPONSE CURVES FOR JASPER COUNTY SOILS



As seen, all of these dose response curves for tissues are fit by linear equations. In most cases, the slope of the best-fit dose-response line for test soil was similar to or somewhat lower than the best-fit dose-response line for lead acetate.

4.3 Calculated RBA Values

Relative bioavailability values were calculated for each test material for each measurement endpoint (blood, bone, liver, kidney) using the method described in Section 3.0. The results are shown below:

Measurement Endpoint	Test material		
	HL Smelter	LL Yard	HL Mill
Blood Lead AUC	0.56	0.78	0.82
Liver Lead	0.55	0.70	0.94
Kidney Lead	0.92	1.10	0.66
Bone Lead	0.50	0.77	0.50

<u>Recommended RBA Values</u>

As shown above, for each test material, there are four independent estimates of RBA (based on blood, liver, kidney, and bone), and the values do not agree in all cases. In general, we recommend greatest emphasis be placed on the RBA estimates derived from the blood lead data. There are several reasons for this recommendation, including the following:

1) Blood lead calculations are based on multiple measurements over time, and so are statistically more robust than the single measurements available for tissue concentrations. Further, blood is a homogeneous medium, and is easier to sample than complex tissues such as liver, kidney and bone. Consequently, the AUC endpoint is less susceptible to random measurement errors, and RBA values calculated from AUC data are less uncertain.

2. Blood is the central compartment and one of the first compartments to be affected by absorbed lead. In contrast, uptake of lead into peripheral compartments (liver, kidney, bone) depend on transfer from blood to the tissue, and may be subject to a variety of toxicokinetic factors that could make bioavailability determinations more complicated.

3. The dose-response curve for blood lead is non-linear, similar to the non-linear dose-response curve observed in children (e.g., see Sherlock and Quinn 1986).

Thus, the response of this endpoint is known to behave similarly in swine as in children, and it is not known if the same is true for the tissue endpoints.

4. Blood lead is the classical measurement endpoint for evaluating exposure and health effects in humans, and the health effects of lead are believed to be proportional to blood lead levels.

However, data from the tissue endpoints (liver, kidney, bone) also provide valuable information. We consider the plausible range to extend from the RBA based on blood AUC to the mean of the other three tissues (liver, kidney, bone). The preferred range is the interval from the RBA based on blood to the mean of the blood RBA and the tissue mean RBA. Our suggested point estimate is the mid-point of the preferred range. These values are presented below:

Test Material	Relative Bioavailability of Lead		
	Plausible Range	Preferred Range	Suggested Point Estimate
HL Smelter	0.56-0.66	0.56-0.61	0.58
LL Yard	0.78-0.86	0.78-0.82	0.80
HL Mill	0.82-0.70	0.82-0.76	0.79

4.4 Estimated Absolute Bioavailability in Children

These RBA estimates may be used to help assess lead risk at this site by refining the estimate of absolute bioavailability (ABA) of lead in soil, as follows:

$$ABA_{soil} = ABA_{soluble} \cdot RBA_{soil}$$

Available data indicate that fully soluble forms of lead are about 50% absorbed by a child (USEPA 1991, 1994). Thus, the estimated absolute bioavailability of lead in site soils are calculated as follows:

$$ABA_{HL\ Smelter} = 50\% \cdot RBA_{HL\ Smelter}$$

$$ABA_{LL\ Yard} = 50\% \cdot RBA_{LL\ Yard}$$

$$ABA_{HL\ Mill} = 50\% \cdot RBA_{HL\ Mill}$$

Based on the RBA values shown above, the estimated absolute bioavailabilities in children are as follows:

[illegible] Material	Absolute Bioavailability of Lead		
	Plausible Range	Preferred Range	Suggested Point Estimate
HL Smelter	28%-33%	28%-30%	29%
[illegible] Yard	39%-43%	39%-41%	40%
[illegible] Mill	35%-41%	38%-41%	40%

4.5 Uncertainty

These absolute bioavailability estimates are appropriate for use in EPA's IEUBK model for this site, although it is clear that there is both variability and uncertainty associated with these estimates. This variability and uncertainty arises from several sources. First, differences in physiological and pharmacokinetic parameters between individual animals leads to variability in response even when exposure is the same. Because of this inter-animal variability in the responses of different animals to lead exposure, there is mathematical uncertainty in the best fit dose-response curves for both lead acetate and test material. This in turn leads to uncertainty in the calculated values of RBA, because these are derived from the two best-fit equations. Second, there is uncertainty in how to weight the RBA values based on the different endpoints, and how to select a point estimate for RBA that is applicable to typical site-specific exposure levels. Third, there is uncertainty in the extrapolation of measured RBA values in swine to young children. Even though the immature swine is believed to be a useful and meaningful animal model for gastrointestinal absorption in children, it is possible that differences in stomach pH, stomach emptying time, and other physiological parameters may exist and that RBA values in swine may not be precisely equal to values in children. Finally, studies in humans reveal that lead absorption is not constant even within an individual, but varies as a function of many factors (mineral intake, health status, etc.). One factor that may be of special importance is time after the last meal, with the presence of food tending to reduce lead absorption. The values of RBAs measured in this study are intended to estimate the maximum uptake that occurs when lead is ingested in the absence of food. Thus, these values may be somewhat conservative for children who ingest lead along with food. The magnitude of this bias is not known, although preliminary studies in swine suggest the factor may be relatively minor.

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APPENDIX A

DETAILED DATA AND CALCULATIONS FOR USEPA SWINE BIOAVAILABILITY STUDY PHASE II, EXPERIMENTS 3 and 4

JASPER COUNTY, MISSOURI SUPERFUND SITE

APPENDIX A

DETAILED DATA SUMMARY

1.0 OVERVIEW

Performance of these studies involved collection and reduction of a large number of data items. All of these data items and all of the data reduction steps are contained within two Microsoft Excel spreadsheets named "JASPER1.XLS" and "JASPER2.XLS" that are available upon request from the administrative record. JASPER1.XLS contains data from Phase II Experiment 3 in which HL Smelter and LL Yard soils were evaluated, and JASPER2.XLS contains data for HL Mill evaluated in Phase II Experiment 4. These files are intended to allow detailed review and evaluation by outside parties of all aspects of the study.

All tables and figures referred to in this Appendix are printouts of selected tables and graphs from the XLS files. These tables and graphs are all presented at the end of the text section, grouped by experiment. These tables and graphs provide a more detailed documentation of the individual animal data and the data reduction steps performed in these studies than was presented in the main text. Any additional details of interest to a reader can be found in the XLS spreadsheets.

2.0 RAW DATA AND DATA REDUCTION STEPS

2.1 Body Weights and Dose Calculations

Animals were weighed on day -1 (one day before exposure) and every three days thereafter during the course of the study. Doses of lead for the three days following each weighing were based on the group mean body weight, adjusted by addition of 1 kg to account for the expected weight gain over the interval. After completion of the experiment, body weights were estimated by interpolation for those days when measurements were not collected, and the actual administered doses (ug Pb/kg) were calculated for each day and then averaged across all days. If an animal missed a dose or was given an incorrect dose, the calculation of average dose corrected for these factors. These data and data reduction steps are shown in Tables A-1 and A-2.

2.2 Blood Lead vs Time

Blood lead values were measured in each animal on days -4, 0, 1, 2, 3, 5, 7, 9, 12, and 15. The raw laboratory data (reported as ug/L of diluted blood) are shown in Table A-3. These data were adjusted as follows: a) non-detects were evaluated by assuming a value equal to one-half the quantitation limit, and b) the concentrations in diluted blood were converted to units of ug/dL in whole blood by dividing by a factor of 1 dL of blood per L of diluted sample. The results are shown in the right-hand column of Table A-3. Figures A-1 to A-3 plot the results for individual animals organized by group and by day. Figure A-4 plots the mean for each dosing group by day.

After adjustment as above, values that were more than a factor of 1.5 above or below the group mean for any given day were "flagged" by computer as potential outliers. These values are shown in Table A-4 by cells that are shaded gray. Each data point identified in this way was reviewed and professional judgment was used to decide if the value should be retained or excluded. In order to avoid inappropriate biases, blood lead outlier designations were restricted to values that were clearly aberrant from a time-course and/or dose-response perspective. Those which were judged to warrant exclusion are shown by a heavy black box around the value. All other flagged values were retained.

Rarely, a value not flagged by the computer was judged to be an outlier that should be excluded. These are shown by unshaded cells surrounded by a heavy black box. (There are none in this study).

Table A-5 provided a discussion of the rationale used to decide if a blood lead value should be designated as an outlier or not.

2.3 Blood Lead AUC

The area under the blood lead vs time curve for each animal was calculated by finding the area under the curve for each time step using the trapezoidal rule:

$$AUC(d_i \text{ to } d_j) = 0.5*(r_i+r_j)*(d_j-d_i)$$

where:

d = day number
r = response (blood lead value) on day i (r_i) or day j (r_j)

The areas were then summed for each of the time intervals to yield the final AUC for each animal. These calculations are shown in Table A-6. If a blood lead value was missing (either because of problems with sample preparation, or because the measured value was excluded as an outlier), the blood lead value for that day was estimated by linear interpolation.

2.4 Liver, Kidney and Bone Lead Data

At sacrifice (day 15), samples of liver, kidney and bone (femur) were removed and analyzed for lead. The raw data (expressed as ug Pb/L of prepared sample) are summarized in Table A-7. These data were adjusted as follows: a) non-detects were evaluated by assuming a value equal to one-half the quantitation limit, and b) the concentrations in prepared sample were converted to units of concentration in the original biological sample by dividing by the following factors:

Liver:	0.1 kg wet weight/L prepared sample
Kidney:	0.1 kg wet weight/L prepared sample
Bone:	2 gm ashed weight/L prepared sample

The resulting values are shown in the right-hand column of Table A-7.

3.0 CURVE FITTING

Basic Equations

A commercial curve-fitting program (Table Curve-2D™ Version 2.0 for Windows, available from Jandel Scientific) was used to derive best fit equations for each of the individual dose-response data sets derived above. A least squares regression method was used for both linear and non-linear equations. As discussed in the text, three different user-defined equations were fit to each data set:

Linear (LIN): $\text{Response} = a + b \cdot \text{Dose}$

Exponential (EXP): $\text{Response} = a + c \cdot (1\text{-}\exp(-d \cdot \text{Dose}))$

Combination (LIN+EXP): $\text{Response} = a + b \cdot \text{Dose} + c \cdot (1\text{-}\exp(-d \cdot \text{Dose}))$

Constraints

In the process of finding the best-fits of these equations to the data, the values of the parameters (a, b, c, and d) were constrained as follows:

- Parameter "a" (the intercept, equal to the baseline or control value of the measurement endpoint) was constrained to be non-negative and was forced in all cases to be the same for the reference material (lead acetate) and the test materials. This is because, by definition, all dose-response curves for groups of animals exposed to different materials must arise from the same value at zero dose. In addition, for blood lead data, "a" was constrained to be equal to the mean of the control group ± 20% (typically 7.5 ± 1.5 AUC units).

- Parameter "b" (the slope of the linear dose-response line) was constrained to non-negative values, since all of the measurement endpoints evaluated are observed to increase, not decrease, as a function of lead exposure.

- Parameter "c" (the plateau value of the exponential curve) was constrained to be non-negative, and was forced to be the same for the reference material (lead acetate) and the test material. This is because: 1) it is expected on theoretical grounds that the plateau (saturation level) should be the same regardless of the source of lead, and 2) curve-fitting of individual curves tended to yield values of "c" that were close to each other and were not statistically different.

- Parameter "d" (which determines where the "bend" in the exponential equation occurs) was constrained to be greater than 0.0045 for the lead acetate blood lead (AUC) dose-response curve. This constraint was judged to be necessary because the weight of evidence from all studies clearly showed the lead acetate blood lead dose response curve was non-linear and was best fit by an exponential equation, but in some studies there were only two low doses of lead acetate used to define the dose-response curve, and this narrow range data set could sometimes be fit nearly as well by a linear as an exponential curve. The choice of the constraint on "d" was selected to be slightly lower than the observed best-fit value of "d" (0.006) when data from all lead acetate AUC dose-response curves from all of the different studies in this program were used. This approach may tend to underestimate relative bioavailability slightly in some studies (especially at low dose), but use of the information gained from all studies is judged to be more robust than basing fits solely on the data from one study.

In general, one of these models (the linear, the exponential, or the combination) usually yielded a fit (as judged by the value of the adjusted correlation coefficient R^2 and by visual inspection of the fit of the line through the measured data points) that was clearly superior to the others. If two or more models fit the data approximately equally well, then the simplest model (that with the fewest parameters) was selected.

Outlier Identification

During the dose-response curve fitting process, all data were carefully reviewed to identify any anomalous values. Typically, the process used to identify outliers was as follows:

Step 1 — Any data points judged to be outliers based on information derived from analysis of data across multiple studies (as opposed to conclusions drawn from within the study) were excluded.

Step 2 — The remaining raw data points were fit to the equation judged to be the most likely to be the best fit (linear, exponential, or mixed). Table Curve 2-D was then used to plot the 95% prediction limits around the best fit line. All data points that fell outside the 95% prediction limits were considered to be outliers and were excluded.

Step 3 — After excluding these points (if any), a new best-fit was obtained. In some cases, data points originally inside the 95% prediction limits were now outside the limits. However, further iterative cycles of data point exclusion were not performed, and the fit was considered final.

Curve Fit Results

Table A-8 lists the data used to fit these curves, indicating which endpoints were excluded as outliers and why. Table A-9 shows the type of equation selected to fit each data set, and the best fit parameters. The resulting best-fit equations for the data sets are shown in Figures A-5 to A-16 for Experiment 3 and Figures A-5 to A-12 for Experiment 4. Values excluded as outliers are represented in the figures by the symbol "+".

4.0 RESULTS -- CALCULATED RBA VALUES

The value of RBA for a test substance was calculated for a series of doses using the following procedure:

1. For each dose, calculate the expected response to test material, using the best fit equation through the dose-response data for that material.

2. For each expected response to test material, calculate the dose of lead acetate that is expected to yield an equivalent response. This is done by "inverting" the dose-response curve for lead acetate, solving for the dose that corresponds to a specified response.

3. Calculate RBA at that dose as the ratio of the dose of lead acetate to the dose of test material. For the situation where both curves are linear, the value of RBA is the ratio of the slopes (the "b" parameters). In the case where both curves are exponential and where both curves have the same values for parameters "a" and "c", the value of RBA is equal to the ratio of the "d" parameters.

The results are summarized in Table A-10.

5.0 QUALITY ASSURANCE DATA

A number of steps were taken throughout this study and the other studies in this project to ensure the quality of the results, including 5% duplicates, 5% standards, a program of interlaboratory comparison. These steps are detailed below.

Duplicates

Duplicate samples were prepared and analyzed for about 5% of all samples generated during the study. Table A-11 lists the first and second values for blood, liver, kidney, and bone. The results are shown in Figure 3-1 in the main text.

Standards

The Centers for Disease Control and Prevention (CDCP) provides a variety of blood lead "check samples" for use in quality assurance programs for blood lead studies. Each time a group of blood samples was prepared and sent to the laboratory for analysis, several CDCP check samples of different concentrations were included. Table A-12 lists the concentrations reported by the laboratory compared to the nominal concentrations indicated by CDCP for the samples submitted during this study, and the results are plotted in Figure 3-2 in the main text.

Interlaboratory Comparison

An interlaboratory comparison of blood lead analytical results was performed by sending a set of 15 randomly selected whole blood samples from this study to CDCP for independent analysis. The data are presented in Table A-13, and the results are plotted in Figure 3-3 in the main text.

TABLES AND GRAPHS FROM EXPERIMENT 3

TABLE A-1 BODY WEIGHTS AND ADMINISTERED DOSES, BY DAY

Body weights were measured on days -1, 2, 5, 8, 11, 14. Weights for other days are estimated, based on linear interpolation between measured values.

Group	ID #	Day -1 BW (kg)	Day -1 ug Pb per da	Day 0 BW (kg)	Day 0 ug Pb per day	Day 1 BW (kg)	Day 1 ug Pb per day	Day 2 BW (kg)	Day 2 ug Pb per day	Day 3 BW (kg)	Day 3 ug Pb per day	Day 4 BW (kg)	Day 4 ug Pb per day	Day 5 BW (kg)	Day 5 ug Pb per day	Day 6 BW (kg)	Day 6 ug Pb per day
1	304	10.9	0	11.1	0	11.2	0	11.4	0	11.8	0	12.1	0	12.5	0	12.9	0
1	339	8.6	0	8.9	0	9.3	0	9.6	0	9.7	0	9.8	0	9.9	0	10.5	0
2	309	10.5	0	10.5	414	10.6	828	10.6	828	10.9	896	11.3	896	11.6	896	12.0	966
2	312	9.8	0	10.4	828	11.0	828	11.6	828	11.9	896	12.3	896	12.6	896	13.0	966
2	324	10.4	0	10.7	828	10.9	621	11.2	828	11.3	896	11.5	896	11.8	896	12.0	966
2	337	10.8	0	11.0	828	11.1	828	11.3	828	11.6	896	12.0	896	12.3	896	12.7	966
2	340	8.7	0	9.1	828	9.6	828	10	828	10.4	896	10.9	896	11.3	896	11.8	966
3	313	8.5	0	8.7	2484	8.9	2484	9.1	2484	9.6	2687	10.1	2687	10.6	2687	10.6	2898
3	315	9.5	0	9.8	2484	10.1	2484	10.4	2484	10.9	2687	11.3	2687	11.8	2687	11.9	2898
3	342	10.2	0	10.4	2484	10.6	2484	10.8	2484	11.1	2687	11.3	2687	11.6	2687	12.0	2898
3	354	9.1	0	9.4	2484	9.7	2484	10	2484	10.5	2687	11.1	2687	11.6	2687	12.0	2898
3	356	10.6	0	10.7	2484	10.7	2484	10.8	2484	10.9	2687	11.1	2687	11.2	2687	11.8	2898
4	305	8.7	0	8.8	787	8.9	787	9	787	9.4	810	9.9	810	10.3	810	10.7	893
4	311	9	0	9.2	787	9.3	787	9.5	787	9.9	810	10.4	810	10.9	810	11.2	893
4	318	8.3	0	8.9	787	9.5	787	10.1	787	10.4	810	10.8	810	11.1	810	11.5	893
4	321	10	0	10.3	787	10.6	787	10.9	787	11.4	810	11.8	810	12.3	810	12.7	893
4	331	9.1	0	9.2	787	9.4	787	9.5	787	9.7	810	9.8	810	10	810	10.4	893
5	316	10.4	0	10.4	2529	10.4	2529	10.4	2529	10.7	2741	11.0	2741	11.3	2741	11.8	3002
5	317	10	0	10.5	1265	10.9	2529	11.4	2529	11.9	2741	12.4	2741	12.9	2741	13.4	3002
5	330	10.8	0	11.2	2529	11.5	2529	11.9	2529	12.2	2741	12.4	2741	12.7	2741	13.2	3002
5	352	9.8	0	10.1	2529	10.5	2529	10.8	2529	11.3	2741	11.7	2741	12.2	2741	12.6	3002
5	353	10.2	0	10.6	2529	11.0	2529	11.4	2529	11.8	2741	12.2	2741	12.6	2741	12.7	3002
6	319	9.7	0	9.9	8127	10.0	8127	10.2	8127	10.5	8613	10.8	8613	11.2	8613	11.7	9410
6	341	10.6	0	10.6	8127	10.7	8127	10.7	8127	11.0	8613	11.2	8613	11.5	8613	11.9	9410
6	344	10.4	0	10.9	8127	11.4	8127	11.9	8127	12.3	8613	12.8	8613	13.2	8613	13.6	9410
6	345	9.7	0	10.3	8127	10.8	8127	11.4	8127	11.8	8613	12.2	8613	12.6	8613	12.9	9410
6	348	9.3	0	9.6	8127	10.0	8127	10.3	8127	10.8	8613	11.2	8613	11.7	8613	12.1	9410
7	325	12.7	0	13.0	903	13.2	903	13.5	903	13.9	957	14.2	957	14.6	957	15.0	1046
7	329	11.7	0	12.1	903	12.6	903	13	903	13.2	957	13.4	957	13.6	957	14.0	1046
7	338	10.2	0	10.4	903	10.7	903	10.9	903	11.4	957	11.9	957	12.4	957	12.8	1046
7	343	9.4	0	9.9	903	10.4	903	10.9	903	11.5	957	12.0	957	12.6	957	13.1	1046
7	351	10.3	0	10.7	903	11.2	903	11.6	903	12.0	957	12.5	957	12.9	957	13.4	1046
8	302	9.8	0	9.8	2295	9.9	2295	9.9	2295	10.3	2448	10.7	2448	11.1	2448	11.6	2646
8	326	9.7	0	10.0	2295	10.3	2295	10.6	2295	10.9	2448	11.2	2448	11.5	2448	12.0	2646
8	328	10.8	0	11.1	2295	11.4	2295	11.6	2295	12.0	2448	12.4	2448	12.8	2448	13.1	2646
8	332	8.7	0	7.5	2295	8.4	2295	9.2	2295	9.4	2448	9.6	2448	9.8	2448	9.9	2646
8	346	8.8	0	8.6	2295	8.4	2295	8.1	1148	8.3	2448	8.4	2448	8.6	2448	9.1	2646
9	308	11.5	0	11.7	8127	11.9	8127	12.1	8127	12.5	8613	12.8	8613	13.2	8613	13.7	9410
9	333	11	0	11.2	8127	11.4	8127	11.6	8127	12.0	8613	12.5	8613	12.9	8613	13.4	9410
9	334	11.2	0	11.4	8127	11.6	8127	11.8	8127	12.2	8613	12.5	8613	12.9	8613	13.4	9410
9	335	10.2	0	10.5	8127	10.8	8127	11.1	8127	11.5	8613	11.8	8613	12.2	8613	12.6	9410
9	349	11.3	0	11.6	8127	11.9	8127	12.2	8127	12.6	8613	13.1	8613	13.5	8613	13.9	9410
10	307	11.8	0	12.1	1213	12.3	1213	12.6	909	12.8	1278	12.9	1278	13.1	1278	13.5	1345
10	320	11.8	0	11.9	1213	12.1	1213	12.2	1213	12.6	1278	13.0	1278	13.4	1278	13.7	1345
10	322																
10	347	10.3	0	10.7	1213	11.2	1213	11.6	1213	11.7	1278	11.7	1278	11.8	1278	12.2	1345
10	350	10.6	0	10.6	1213	10.7	1213	10.7	1213	11.0	1278	11.2	1278	11.5	1278	11.8	1345

Group	ID #	Day 7 BW (kg)	Day 7 ug Pb per day	Day 8 BW (kg)	Day 8 ug Pb per day	Day 9 BW (kg)	Day 9 ug Pb per day	Day 10 BW (kg)	Day 10 ug Pb per day	Day 11 BW (kg)	Day 11 ug Pb per day	Day 12 BW (kg)	Day 12 ug Pb per day	Day 13 BW (kg)	Day 13 ug Pb per day	Day 14 BW (kg)	Day 14 ug Pb per day	Day 15 BW (kg)	Day 15 ug Pb per day
1	304	13.3	0	13.7	0	14.1	0	14.4	0	14.8	0	15.3	0	15.8	0	16.3	0	16.8	0
1	339	11.2	0	11.8	0	12.2	0	12.7	0	13.1	0	14.3	0	15.5	0	16.7	0	17.9	0
2	309	12.5	966	12.9	966	13.3	1062	13.8	1062	14.2	1062	14.7	1151	15.2	1151	15.7	1151	16.2	0
2	312	13.4	966	13.8	966	14.2	1062	14.7	1062	15.1	1062	15.8	1151	16.4	1151	17.1	1151	17.8	0
2	324	12.4	966	12.8	966	13.2	1062	13.5	1062	13.9	1062	14.5	1151	15.2	1151	15.8	1151	16.4	0
2	337	13.1	966	13.5	966	14.0	1062	14.6	1062	15.1	1062	15.3	1151	15.6	1151	15.8	1151	16.0	0
2	340	12.3	966	12.8	966	13.0	1062	13.2	1062	13.4	1062	13.7	1151	14.1	1151	14.4	1151	14.7	0
3	313	10.5	2898	10.5	2898	11.0	3186	11.5	3186	12	3186	12.6	3452	13.2	3452	13.8	3452	14.4	0
3	315	12.0	2898	12.1	2898	12.7	3186	13.3	3186	13.9	3186	14.6	3452	15.4	3452	16.1	3452	16.8	0
3	342	12.5	2898	12.9	2898	13.4	3186	13.8	3186	14.3	3186	14.6	3452	15.0	3452	15.3	3452	15.6	0
3	354	12.5	2898	12.9	2898	13.0	3186	13.2	3186	13.3	6730	14.1	3452	15.0	3452	15.8	3452	16.6	0
3	356	12.5	2898	13.1	2898	13.5	3186	13.9	3186	14.3	3186	14.6	3452	15.0	3452	15.3	3452	15.6	0
4	305	11.1	893	11.5	893	12.0	987	12.5	987	13	987	13.6	1098	14.2	1098	14.8	1098	15.4	0
4	311	11.7	893	12.1	893	12.5	987	13.0	987	13.4	987	13.9	1098	14.4	1098	14.9	1098	15.4	0
4	318	12.0	893	12.4	893	13.0	987	13.7	987	14.3	987	14.9	1098	15.5	1098	16.1	1098	16.7	0
4	321	13.2	893	13.6	893	14.0	987	14.5	987	14.9	987	15.5	1098	16.2	1098	16.8	1098	17.4	0
4	331	10.8	893	11.2	893	11.7	987	12.1	987	12.6	987	13.2	1098	13.7	1098	14.3	1098	14.9	0
5	316	12.4	3002	12.9	3002	13.4	3272	13.8	3272	14.3	3272	14.9	3564	15.6	3564	16.2	3564	16.8	0
5	317	13.8	3002	14.3	3002	14.8	3272	15.4	3272	16	3272	16.6	3564	17.1	3564	17.7	3564	18.3	0
5	330	13.6	3002	14.1	3002	14.5	3272	15.0	3272	15.4	3272	16.0	3564	16.5	3564	17.1	3564	17.7	0
5	352	13.0	3002	13.4	3002	13.8	3272	14.2	3272	14.6	3272	15.1	3564	15.7	3564	16.2	3564	16.7	0
5	353	12.8	3002	13	3002	13.3	3272	13.6	3272	13.9	3272	14.5	3564	15.2	3564	15.8	3564	16.4	0
6	319	12.1	9410	12.6	9410	13.2	10274	13.8	10274	14.4	10274	15.1	11259	15.7	11259	16.4	11259	17.1	0
6	341	12.2	9410	12.6	9410	12.9	10274	13.1	10274	13.3	10274	13.8	11259	14.0	11259	14.3	11259	14.6	0
6	344	13.9	9410	14.3	9410	14.7	10274	15.0	10274	15.4	10274	16.0	11259	16.5	11259	17.1	11259	17.7	0
6	345	13.3	9410	13.6	9410	14.0	10274	14.5	10274	14.9	10274	15.4	11259	16.0	11259	16.5	11259	17.0	0
6	348	12.4	9410	12.8	9410	13.3	10274	13.9	10274	14.4	10274	14.9	11259	15.5	11259	16	11259	16.5	0
7	325	15.5	1046	15.9	1046	16.4	1142	17.0	1142	17.5	1142	18.2	1251	18.8	1251	19.5	1251	20.2	0
7	329	14.5	1046	14.9	1046	15.3	1142	15.8	1142	16.2	1142	16.6	1251	17.1	1251	17.5	1251	17.9	0
7	338	13.1	1046	13.5	1046	13.9	1142	14.4	1142	14.8	1142	15.4	1251	16.0	1251	16.6	1251	17.2	0
7	343	13.5	1046	14	1046	14.6	1142	15.1	1142	15.7	1142	16.3	1251	16.8	1251	17.4	1251	18.0	0
7	351	13.8	1046	14.3	1046	14.9	1142	15.4	1142	16	1142	16.6	1251	17.3	1251	17.9	1251	18.5	0
8	302	12.0	2646	12.5	2646	13.0	2907	13.4	2907	13.9	2907	14.5	3258	15.1	3258	15.7	3258	16.3	0
8	326	12.5	2646	13	2646	13.4	2907	13.8	2907	14.2	2907	14.7	3258	15.1	3258	15.6	3258	16.1	0
8	328	13.4	2646	13.7	2646	14.3	2907	14.8	2907	15.4	2907	15.8	3258	16.3	3258	16.7	3258	17.1	0
8	332	10.1	2646	10.2	2646	10.8	2907	11.5	2907	12.2	2907	12.7	3258	13.3	3258	13.8	3258	14.3	0
8	346	9.7	2646	10.2	2646	10.7	2907	11.2	2907	11.7	2907	12.3	3258	13.0	3258	13.6	3258	14.2	0
9	308	14.1	9410	14.6	9410	15.1	10274	15.7	10274	16.2	10274	16.7	11259	17.3	11259	17.8	11259	18.3	0
9	333	13.8	9410	14.3	9410	14.7	10274	15.1	10274	15.5	10274	15.9	11259	16.3	11259	16.7	11259	17.1	0
9	334	13.8	9410	14.3	9410	14.8	10274	15.2	10274	15.7	10274	16.2	11259	16.7	11259	17.2	11259	17.7	0
9	335	13.0	9410	13.4	9410	13.9	10274	14.4	10274	14.9	10274	15.5	11259	16.2	11259	16.8	11259	17.4	0
9	349	14.2	9410	14.5	9410	15.0	10274	15.6	10274	16.1	10274	16.6	11259	17.2	11259	17.7	11259	18.2	0
10	307	13.8	1345	14.2	1345	14.8	1450	15.4	1450	16	1450	16.7	1600	17.4	1600	18.1	1600	18.8	0
10	320	14.1	1345	14.4	1345	14.9	1450	15.4	1450	15.9	1450	16.3	1600	16.7	1600	17.1	1600	17.5	0
10	322																		
10	347	12.5	1345	12.9	1345	13.2	1450	13.6	1450	13.9	1450	14.2	1600	14.4	1600	14.7	1600	15.0	0
10	350	12.2	1345	12.5	1345	13.1	1450	13.6	1450	14.2	1450	14.7	1600	15.3	1600	15.8	1600	16.3	0

Shaded boxes show days in which administered doses were ingested late
Animal removed during course of study
Days which required adjustment due to deviations in dosing (ie. Missed doses)

Day 0

Pig 309 did not receive one dose. Daily dose adjusted to 50%.
Pig 317 did not receive one dose. Daily dose adjusted to 50%.

Day 1

Pig 324 did not receive a portion of one dose. Daily dose adjusted to 75%.

Day 2

Pig 348 did not take one dose. Daily dose adjusted to 50%.
Pig 307 lost some of one dose. Daily dose adjusted to 75%.

Day 11

Pig 354 received one dose for group 6 instead of one of its assigned dose. Daily dose adjusted to reflect this deviation

TABLE A-2

Body Weight Adjusted Doses

(Dose for Day/BW for Day)

Group	ID #	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Avg Dose	Target Dose	% Target	Avg %
1	304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0		
1	339	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0		
2	309	39.304	78.360	78.113	81.905	79.482	77.198	80.277	77.487	74.884	79.650	77.143	74.789	78.265	75.691	73.280	75.06	75	100	
2	312	79.615	75.273	71.379	75.042	73.003	71.071	74.308	72.090	70.000	74.614	72.409	70.331	72.970	70.010	67.281	72.63	75	97	
2	324	77.625	56.799	73.929	79.015	76.096	77.198	80.500	77.903	75.469	80.658	78.473	76.403	79.163	75.857	72.816	75.99	75	101	
2	337	75.502	74.371	73.274	76.977	74.833	72.805	76.063	73.740	71.556	75.677	72.906	70.331	75.033	73.908	72.816	73.99	75	99	
2	340	90.657	86.551	82.800	85.831	82.408	79.246	81.864	78.537	75.469	81.692	80.455	79.254	83.774	81.789	79.896	82.01	75	109	101
3	313	285.517	279.101	272.967	279.844	265.990	253.443	274.259	275.127	276.000	269.636	277.043	265.500	273.929	261.477	250.109	272.00	225	121	
3	315	253.469	245.941	238.846	247.224	237.044	227.669	243.529	241.500	239.504	250.866	239.549	229.209	235.866	224.610	214.379	237.95	225	106	
3	342	238.846	234.340	230.000	242.756	237.044	231.595	240.831	232.460	224.651	238.354	230.313	222.797	235.866	230.612	225.588	233.07	225	104	
3	354	264.255	256.082	248.400	255.047	242.756	231.595	240.831	232.460	224.651	244.450	241.975	505.996	244.210	230.612	218.449	258.78	225	115	
3	356	232.875	231.429	230.000	245.716	242.756	239.866	244.901	232.460	221.221	236.000	229.209	222.797	235.866	230.612	225.588	233.42	225	104	110
4	305	87.102	86.124	85.167	85.866	82.095	78.641	83.411	80.405	77.609	82.250	78.960	75.923	80.735	77.324	74.189	81.05	75	108	
4	311	83.618	82.125	80.684	81.544	78.135	75.000	79.451	76.500	73.760	78.750	76.118	73.657	78.993	76.250	73.691	77.89	75	104	
4	316	80.122	77.949	75.891	77.636	75.232	72.973	77.384	74.582	71.976	75.729	72.220	69.021	73.691	70.839	68.199	74.23	75	99	
4	321	74.417	72.311	70.321	71.261	68.451	65.854	70.092	67.785	65.625	70.333	68.226	66.242	70.687	67.918	65.357	68.99	75	92	
4	331	83.014	81.833	80.684	83.793	82.373	81.000	85.817	82.639	79.688	84.600	81.346	78.333	83.392	79.951	76.783	81.68	75	109	102
5	316	243.173	243.173	243.173	256.121	249.136	242.522	253.648	242.709	232.674	244.751	236.494	228.776	238.661	228.951	220.000	240.26	225	107	
5	317	120.812	231.311	221.842	230.294	221.006	212.442	224.551	216.976	209.895	220.056	211.976	204.469	215.131	208.016	201.356	210.01	225	93	
5	330	226.478	219.277	212.521	225.247	220.416	215.787	227.962	220.159	212.872	225.103	218.586	212.435	223.215	215.565	208.421	218.94	225	97	
5	352	249.572	241.624	234.167	243.240	233.565	224.631	238.214	230.885	223.993	237.065	230.387	224.075	235.507	227.489	220.000	232.96	225	104	
5	353	236.585	229.909	221.842	232.246	224.631	217.500	235.720	233.277	230.885	245.977	240.551	235.360	245.229	234.989	225.570	232.82	225	103	101
6	319	823.682	810.000	796.765	817.690	792.607	769.018	806.529	775.506	746.786	778.295	744.457	713.438	747.279	715.614	686.524	768.28	675	114	
6	341	784.295	761.906	759.533	785.380	766.736	748.957	792.935	769.169	746.786	800.532	786.237	772.444	825.844	806.134	787.343	778.28	675	115	
6	344	745.596	712.895	682.941	698.351	674.646	652.500	693.575	675.323	658.007	700.466	683.381	667.110	705.157	680.988	658.421	685.96	675	102	
6	345	791.591	750.165	712.895	729.915	705.984	683.571	727.539	709.259	691.875	732.076	710.150	689.497	729.525	705.157	682.364	716.77	675	106	
6	348	843.633	815.416	789.029	799.969	766.736	736.154	779.793	756.796	735.117	770.513	740.677	713.438	753.951	727.953	703.686	762.20	675	113	110
7	325	69.640	68.237	66.889	69.014	67.237	65.548	69.545	67.597	65.755	69.462	67.279	65.229	68.862	66.425	64.154	67.39	75	90	
7	329	74.423	71.857	69.462	72.500	71.418	70.368	74.501	72.270	70.168	74.446	72.400	70.463	75.210	73.301	71.486	72.28	75	96	
7	338	86.550	84.656	82.844	83.947	80.420	77.177	81.893	79.607	77.444	81.926	79.455	77.128	81.234	78.188	75.361	80.52	75	107	
7	343	91.212	86.827	82.844	83.459	79.529	75.952	80.013	77.254	74.679	78.364	75.430	72.707	78.906	74.317	71.897	78.76	75	105	
7	351	84.130	80.866	77.845	79.529	76.765	74.186	78.217	75.578	73.112	76.783	73.963	71.344	75.210	72.452	69.888	75.99	75	101	100
8	302	233.390	232.601	231.818	237.670	228.785	220.541	228.761	219.889	211.680	224.190	216.402	209.137	224.690	215.762	207.516	222.86	225	99	
8	326	229.500	222.816	216.509	224.587	218.571	212.870	220.500	211.680	203.538	216.940	210.652	204.716	222.136	215.286	208.846	215.94	225	96	
8	328	206.138	201.906	197.845	204.000	197.419	191.250	201.985	197.463	193.139	203.762	195.978	188.766	205.768	200.287	195.090	198.72	225	88	
8	332	304.646	274.303	249.457	260.426	255.000	249.796	266.376	262.848	259.412	267.515	252.052	238.279	255.864	245.578	236.087	258.51	225	115	
8	346	265.830	274.303	141.667	296.129	290.277	284.651	289.708	273.724	259.412	271.682	259.554	248.462	264.162	251.260	239.559	260.69	225	116	103
9	306	694.615	682.941	671.653	690.882	671.143	652.500	688.500	665.767	644.466	678.866	655.755	634.167	672.849	652.066	632.526	665.91	675	99	
9	333	725.625	712.895	700.603	715.762	690.882	667.674	703.953	680.205	658.007	698.878	680.364	662.806	708.113	690.736	674.192	691.38	675	102	
9	334	712.895	700.603	688.729	707.918	687.207	667.674	703.953	680.205	658.007	695.722	674.409	654.363	695.000	674.192	654.593	683.70	675	101	
9	335	774.000	752.500	732.162	751.134	727.859	705.984	746.786	723.808	702.201	739.101	713.438	689.497	724.828	696.433	670.179	723.33	675	107	
9	349	700.603	682.941	666.148	681.768	659.158	638.000	680.205	664.200	646.931	683.381	659.968	638.106	676.894	655.864	636.102	664.82	675	98	102
10	307	100.483	98.311	72.173	100.065	98.776	97.519	99.876	97.229	94.718	97.973	94.156	90.625	95.808	91.954	88.396	94.54	100	95	
10	320	101.606	100.483	99.385	101.389	98.269	95.336	97.937	95.616	93.403	97.315	94.156	91.195	98.160	95.808	93.567	96.91	100	97	
10	322																	100		
10	347	112.966	108.582	104.526	109.500	108.676	108.263	110.546	107.314	104.264	109.572	106.880	104.317	112.941	110.855	108.844	108.55	100	109	
10	350	114.028	113.672	113.318	116.489	113.724	111.087	113.662	110.546	107.600	110.969	106.357	102.113	108.597	104.803	101.266	109.88	100	110	102

Animal removed during course of study

TABLE A - 3 RAW AND ADJUSTED BLOOD LEAD DATA

PHASE II EXPERIMENT 3

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)*	Notes
304	8-903051	1	control	0	<	1	-4	a:pig24.da	BLOOD	0.5	
339	8-903099	1	control	0			-4		BLOOD		No sample
309	8-903091	2	PbAc	75	<	1	-4	a:pig24.da	BLOOD	0.5	
312	8-903102	2	PbAc	75		1	-4	a:pig24.da	BLOOD	1	
324	8-903018	2	PbAc	75	<	1	-4	a:pig24.da	BLOOD	0.5	
337	8-903070	2	PbAc	75	<	1	-4	a:pig24.da	BLOOD	0.5	
340	8-903085	2	PbAc	75		1.1	-4	a:pig24.da	BLOOD	1.1	
313	8-903058	3	PbAc	225	<	1	-4	a:pig24.da	BLOOD	0.5	
315	8-903132	3	PbAc	225	<	1	-4	a:pig24.da	BLOOD	0.5	
342	8-903143	3	PbAc	225		1	-4	a:pig24.da	BLOOD	1	
354	8-903075	3	PbAc	225	<	1	-4	a:pig24.da	BLOOD	0.5	
356	8-903155	3	PbAc	225	<	1	-4	a:pig24.da	BLOOD	0.5	
305	8-903044	4	HL Smelter	75	<	1	-4	a:pig24.da	BLOOD	0.5	
311	8-903159	4	HL Smelter	75	<	1	-4	a:pig24.da	BLOOD	0.5	
318	8-903007	4	HL Smelter	75	<	1	-4	a:pig24.da	BLOOD	0.5	
321	8-903120	4	HL Smelter	75		1.1	-4	a:pig24.da	BLOOD	1.1	
331	8-903125	4	HL Smelter	75	<	1	-4	a:pig24.da	BLOOD	0.5	
316	8-903138	5	HL Smelter	225		1.1	-4	a:pig24.da	BLOOD	1.1	
317	8-903030	5	HL Smelter	225	<	1	-4	a:pig24.da	BLOOD	0.5	
330	8-903109	5	HL Smelter	225	<	1	-4	a:pig24.da	BLOOD	0.5	
352	8-903131	5	HL Smelter	225	<	1	-4	a:pig24.da	BLOOD	0.5	
353	8-903029	5	HL Smelter	225	<	1	-4	a:pig24.da	BLOOD	0.5	
319	8-903055	6	HL Smelter	675	<	1	-4	a:pig24.da	BLOOD	0.5	
341	8-903082	6	HL Smelter	675	<	1	-4	a:pig24.da	BLOOD	0.5	
344	8-903121	6	HL Smelter	675	<	1	-4	a:pig24.da	BLOOD	0.5	
345	8-903157	6	HL Smelter	675	<	1	-4	a:pig24.da	BLOOD	0.5	
348	8-903072	6	HL Smelter	675	<	1	-4	a:pig24.da	BLOOD	0.5	
325	8-903079	7	LL Yard	75	<	1	-4	a:pig24.da	BLOOD	0.5	
329	8-903047	7	LL Yard	75	<	1	-4	a:pig24.da	BLOOD	0.5	
338	8-903034	7	LL Yard	75	<	1	-4	a:pig24.da	BLOOD	0.5	
343	8-903086	7	LL Yard	75	<	1	-4	a:pig24.da	BLOOD	0.5	
351	8-903092	7	LL Yard	75	<	1	-4	a:pig24.da	BLOOD	0.5	
302	8-903000	8	LL Yard	225	<	1	-4	a:pig24.da	BLOOD	0.5	
326	8-903083	8	LL Yard	225	<	1	-4	a:pig24.da	BLOOD	0.5	
328	8-903037	8	LL Yard	225	<	1	-4	a:pig24.da	BLOOD	0.5	
332	8-903140	8	LL Yard	225		1	-4	a:pig24.da	BLOOD	1	
346	8-903041	8	LL Yard	225	<	1	-4	a:pig24.da	BLOOD	0.5	
306	8-903028	9	LL Yard	675	<	1	-4	a:pig24.da	BLOOD	0.5	
333	8-903161	9	LL Yard	675	<	1	-4	a:pig24.da	BLOOD	0.5	
334	8-903150	9	LL Yard	675	<	1	-4	a:pig24.da	BLOOD	0.5	
335	8-903053	9	LL Yard	675	<	1	-4	a:pig24.da	BLOOD	0.5	
349	8-903052	9	LL Yard	675	<	1	-4	a:pig24.da	BLOOD	0.5	
301	8-903061	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
307	8-903056	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
310	8-903090	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
320	8-903014	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
322	8-903038	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
347	8-903094	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
350	8-903065	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
355	8-903002	10	IV-100	100	<	1	-4	a:pig24.da	BLOOD	0.5	
304	8-903081	1	control	0	<	1	0	a:pig25.da	BLOOD	0.5	
339	8-903060	1	control	0	<	1	0	a:pig25.da	BLOOD	0.5	
309	8-903046	2	PbAc	75	<	1	0	a:pig25.da	BLOOD	0.5	
312	8-903101	2	PbAc	75	<	1	0	a:pig25.da	BLOOD	0.5	
324	8-903031	2	PbAc	75	<	1	0	a:pig25.da	BLOOD	0.5	
337	8-903054	2	PbAc	75	<	1	0	a:pig25.da	BLOOD	0.5	
340	8-903023	2	PbAc	75	<	1	0	a:pig25.da	BLOOD	0.5	
313	8-903057	3	PbAc	225	<	1	0	a:pig25.da	BLOOD	0.5	
315	8-903129	3	PbAc	225	<	1	0	a:pig25.da	BLOOD	0.5	
342	8-903049	3	PbAc	225	<	1	0	a:pig25.da	BLOOD	0.5	
354	8-903095	3	PbAc	225	<	1	0	a:pig25.da	BLOOD	0.5	
356	8-903066	3	PbAc	225	<	1	0	a:pig25.da	BLOOD	0.5	
305	8-903039	4	HL Smelter	75	<	1	0	a:pig25.da	BLOOD	0.5	
311	8-903116	4	HL Smelter	75	<	1	0	a:pig25.da	BLOOD	0.5	
318	8-903033	4	HL Smelter	75	<	1	0	a:pig25.da	BLOOD	0.5	
321	8-903068	4	HL Smelter	75	<	1	0	a:pig25.da	BLOOD	0.5	
331	8-903059	4	HL Smelter	75	<	1	0	a:pig25.da	BLOOD	0.5	
316	8-903142	5	HL Smelter	225	<	1	0	a:pig25.da	BLOOD	0.5	
317	8-903062	5	HL Smelter	225	<	1	0	a:pig25.da	BLOOD	0.5	
330	8-903124	5	HL Smelter	225	<	1	0	a:pig25.da	BLOOD	0.5	
352	8-903077	5	HL Smelter	225	<	1	0	a:pig25.da	BLOOD	0.5	
353	8-903071	5	HL Smelter	225	<	1	0	a:pig25.da	BLOOD	0.5	
319	8-903078	6	HL Smelter	675	<	1	0	a:pig25.da	BLOOD	0.5	
341	8-903103	6	HL Smelter	675	<	1	0	a:pig25.da	BLOOD	0.5	
344	8-903153	6	HL Smelter	675	<	1	0	a:pig25.da	BLOOD	0.5	
345	8-903158	6	HL Smelter	675	<	1	0	a:pig25.da	BLOOD	0.5	
348	8-903146	6	HL Smelter	675	<	1	0	a:pig25.da	BLOOD	0.5	
325	8-903088	7	LL Yard	75	<	1	0	a:pig25.da	BLOOD	0.5	
329	8-903021	7	LL Yard	75	<	1	0	a:pig25.da	BLOOD	0.5	
338	8-903010	7	LL Yard	75	<	1	0	a:pig25.da	BLOOD	0.5	
343	8-903108	7	LL Yard	75	<	1	0	a:pig25.da	BLOOD	0.5	
351	8-903008	7	LL Yard	75	<	1	0	a:pig25.da	BLOOD	0.5	
302	8-903032	8	LL Yard	225	<	1	0	a:pig25.da	BLOOD	0.5	
326	8-903019	8	LL Yard	225	<	1	0	a:pig25.da	BLOOD	0.5	
328	8-903112	8	LL Yard	225	<	1	0	a:pig25.da	BLOOD	0.5	
332	8-903117	8	LL Yard	225	<	1	0	a:pig25.da	BLOOD	0.5	
346	8-903016	8	LL Yard	225	<	1	0	a:pig25.da	BLOOD	0.5	
306	8-903148	9	LL Yard	675	<	1	0	a:pig25.da	BLOOD	0.5	
333	8-903136	9	LL Yard	675	<	1	0	a:pig25.da	BLOOD	0.5	

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)[a]	Notes
334	8-903027	9	LL Yard	675	<	1	0	a:pig25.da	BLOOD	0.5	
335	8-903145	9	LL Yard	675	<	1	0	a:pig25.da	BLOOD	0.5	
349	8-903135	9	LL Yard	675	<	1	0	a:pig25.da	BLOOD	0.5	
301	8-903139	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
307	8-903123	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
310	8-903087	10	IV-100	100			0		BLOOD		Culled
320	8-903122	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
322	8-903154	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
347	8-903064	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
350	8-903133	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
355	8-903137	10	IV-100	100	<	1	0	a:pig25.da	BLOOD	0.5	
304	8-903141	1	control	0	<	1	1	a:pig25.da	BLOOD	0.5	
339	8-903144	1	control	0	<	1	1	a:pig25.da	BLOOD	0.5	
309	8-903017	2	PbAc	75	<	1	1	a:pig25.da	BLOOD	0.5	
312	8-903011	2	PbAc	75		1.7	1	a:pig25.da	BLOOD	1.7	
324	8-903073	2	PbAc	75		1.1	1	a:pig25.da	BLOOD	1.1	
337	8-903115	2	PbAc	75	<	1	1	a:pig25.da	BLOOD	0.5	
340	8-903130	2	PbAc	75		2	1	a:pig25.da	BLOOD	2	
313	8-903036	3	PbAc	225		6.4	1	a:pig25.da	BLOOD	6.4	
315	8-903107	3	PbAc	225	<	1	1	a:pig25.da	BLOOD	0.5	
342	8-903076	3	PbAc	225		6.8	1	a:pig25.da	BLOOD	6.8	
354	8-903128	3	PbAc	225		3.1	1	a:pig25.da	BLOOD	3.1	
356	8-903156	3	PbAc	225	<	1	1	a:pig25.da	BLOOD	0.5	
305	8-903113	4	HL Smelter	75	<	1	1	a:pig25.da	BLOOD	0.5	
311	8-903015	4	HL Smelter	75		1.3	1	a:pig25.da	BLOOD	1.3	
318	8-903084	4	HL Smelter	75	<	1	1	a:pig25.da	BLOOD	0.5	
321	8-903111	4	HL Smelter	75	<	1	1	a:pig25.da	BLOOD	0.5	
331	8-903050	4	HL Smelter	75	<	1	1	a:pig25.da	BLOOD	0.5	
316	8-903152	5	HL Smelter	225	<	1	1	a:pig25.da	BLOOD	0.5	
317	8-903096	5	HL Smelter	225	<	1	1	a:pig25.da	BLOOD	0.5	
330	8-903009	5	HL Smelter	225		1.5	1	a:pig25.da	BLOOD	1.5	
352	8-903020	5	HL Smelter	225		2	1	a:pig25.da	BLOOD	2	
353	8-903043	5	HL Smelter	225		2.5	1	a:pig25.da	BLOOD	2.5	
319	8-903114	6	HL Smelter	675		5	1	a:pig25.da	BLOOD	5	
341	8-903025	6	HL Smelter	675		2.4	1	a:pig25.da	BLOOD	2.4	
344	8-903160	6	HL Smelter	675		3.2	1	a:pig25.da	BLOOD	3.2	
345	8-903004	6	HL Smelter	675		9.2	1	a:pig25.da	BLOOD	9.2	
348	8-903074	6	HL Smelter	675		3.2	1	a:pig25.da	BLOOD	3.2	
325	8-903069	7	LL Yard	75		2.1	1	a:pig25.da	BLOOD	2.1	
329	8-903003	7	LL Yard	75	<	1	1	a:pig25.da	BLOOD	0.5	
338	8-903093	7	LL Yard	75	<	1	1	a:pig25.da	BLOOD	0.5	
343	8-903149	7	LL Yard	75	<	1	1	a:pig25.da	BLOOD	0.5	
351	8-903013	7	LL Yard	75	<	1	1	a:pig25.da	BLOOD	0.5	
302	8-903151	8	LL Yard	225	<	1	1	a:pig25.da	BLOOD	0.5	
326	8-903012	8	LL Yard	225	<	1	1	a:pig25.da	BLOOD	0.5	
328	8-903100	8	LL Yard	225		7.4	1	a:pig25.da	BLOOD	7.4	
332	8-903104	8	LL Yard	225		7.5	1	a:pig25.da	BLOOD	7.5	
346	8-903042	8	LL Yard	225		1	1	a:pig25.da	BLOOD	1	
306	8-903063	9	LL Yard	675		2.5	1	a:pig25.da	BLOOD	2.5	
333	8-903106	9	LL Yard	675		2	1	a:pig25.da	BLOOD	2	
334	8-903134	9	LL Yard	675		10.7	1	a:pig25.da	BLOOD	10.7	
335	8-903006	9	LL Yard	675		7.4	1	a:pig25.da	BLOOD	7.4	
349	8-903118	9	LL Yard	675		7.1	1	a:pig25.da	BLOOD	7.1	
301	8-903097	10	IV-100	100			1		BLOOD		Culled
307	8-903126	10	IV-100	100		10.6	1	a:pig25.da	BLOOD	10.6	
310	8-903098	10	IV-100	100			1		BLOOD		Culled
320	8-903067	10	IV-100	100		9.8	1	a:pig25.da	BLOOD	9.8	
322	8-903105	10	IV-100	100		8.9	1	a:pig25.da	BLOOD	8.9	
347	8-903089	10	IV-100	100		8.6	1	a:pig25.da	BLOOD	8.6	
350	8-903127	10	IV-100	100		7.4	1	a:pig25.da	BLOOD	7.4	
355	8-903110	10	IV-100	100			1		BLOOD		Culled
304	8-903171	1	control	0	<	1	2	a:pig25.da	BLOOD	0.5	
339	8-903178	1	control	0	<	1	2	a:pig25.da	BLOOD	0.5	
309	8-903162	2	PbAc	75		1.3	2	a:pig25.da	BLOOD	1.3	
312	8-903197	2	PbAc	75		2.5	2	a:pig25.da	BLOOD	2.5	
324	8-903184	2	PbAc	75		1.1	2	a:pig25.da	BLOOD	1.1	
337	8-903206	2	PbAc	75		2.2	2	a:pig25.da	BLOOD	2.2	
340	8-903168	2	PbAc	75		2.1	2	a:pig25.da	BLOOD	2.1	
313	8-903211	3	PbAc	225		7.1	2	a:pig25.da	BLOOD	7.1	
315	8-903174	3	PbAc	225		3.4	2	a:pig25.da	BLOOD	3.4	
342	8-903189	3	PbAc	225		7.3	2	a:pig25.da	BLOOD	7.3	
354	8-903205	3	PbAc	225		3.4	2	a:pig25.da	BLOOD	3.4	
356	8-903202	3	PbAc	225	<	1	2	a:pig25.da	BLOOD	0.5	
305	8-903198	4	HL Smelter	75	<	1	2	a:pig25.da	BLOOD	0.5	
311	8-903193	4	HL Smelter	75		1.3	2	a:pig25.da	BLOOD	1.3	
318	8-903182	4	HL Smelter	75	<	1	2	a:pig25.da	BLOOD	0.5	
321	8-903212	4	HL Smelter	75		2	2	a:pig25.da	BLOOD	2	
331	8-903188	4	HL Smelter	75	<	1	2	a:pig25.da	BLOOD	0.5	
316	8-903176	5	HL Smelter	225	<	1	2	a:pig25.da	BLOOD	0.5	
317	8-903163	5	HL Smelter	225		2.7	2	a:pig25.da	BLOOD	2.7	
330	8-903179	5	HL Smelter	225		2.5	2	a:pig25.da	BLOOD	2.5	
352	8-903209	5	HL Smelter	225		4.2	2	a:pig25.da	BLOOD	4.2	
353	8-903170	5	HL Smelter	225		3.7	2	a:pig25.da	BLOOD	3.7	
319	8-903177	6	HL Smelter	675		7.4	2	a:pig25.da	BLOOD	7.4	
341	8-903187	6	HL Smelter	675		6.3	2	a:pig25.da	BLOOD	6.3	
344	8-903172	6	HL Smelter	675		4.6	2	a:pig25.da	BLOOD	4.6	
345	8-903200	6	HL Smelter	675		9	2	a:pig25.da	BLOOD	9	
348	8-903186	6	HL Smelter	675		9.8	2	a:pig25.da	BLOOD	9.8	
325	8-903165	7	LL Yard	75		1.9	2	a:pig25.da	BLOOD	1.9	
329	8-903185	7	LL Yard	75	<	1	2	a:pig25.da	BLOOD	0.5	
338	8-903175	7	LL Yard	75	<	1	2	a:pig25.da	BLOOD	0.5	
343	8-903164	7	LL Yard	75	<	1	2	a:pig25.da	BLOOD	0.5	
351	8-903180	7	LL Yard	75		1.1	2	a:pig25.da	BLOOD	1.1	
302	8-903167	8	LL Yard	225	<	1	2	a:pig25.da	BLOOD	0.5	
326	8-903190	8	LL Yard	225		1.6	2	a:pig25.da	BLOOD	1.6	

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)*	Notes
328	8-903199	8	LL Yard	225		9.5	2	a:pig25.da	BLOOD	9.5	
332	8-903207	8	LL Yard	225		9.8	2	a:pig25.da	BLOOD	9.8	
346	8-903208	8	LL Yard	225		1.3	2	a:pig25.da	BLOOD	1.3	
306	8-903210	9	LL Yard	675		4	2	a:pig25.da	BLOOD	4	
333	8-903169	9	LL Yard	675		3.2	2	a:pig25.da	BLOOD	3.2	
334	8-903196	9	LL Yard	675		13.8	2	a:pig25.da	BLOOD	13.8	
335	8-903191	9	LL Yard	675		7.8	2	a:pig25.da	BLOOD	7.8	
349	8-903195	9	LL Yard	675		7.5	2	a:pig25.da	BLOOD	7.5	
307	8-903192	10	IV-100	100			2		BLOOD		Clotted
320	8-903204	10	IV-100	100		10.9	2	a:pig25.da	BLOOD	10.9	
322	8-903203	10	IV-100	100		11.8	2	a:pig25.da	BLOOD	11.8	
347	8-903173	10	IV-100	100		10.1	2	a:pig25.da	BLOOD	10.1	
350	8-903183	10	IV-100	100		9	2	a:pig25.da	BLOOD	9	
304	8-903254	1	control	0	<	1	3	a:pig26.da	BLOOD	0.5	
339	8-903245	1	control	0	<	1	3	a:pig26.da	BLOOD	0.5	
309	8-903238	2	PbAc	75		2.1	3	a:pig26.da	BLOOD	2.1	
312	8-903227	2	PbAc	75		1.9	3	a:pig26.da	BLOOD	1.9	
324	8-903263	2	PbAc	75		1.2	3	a:pig26.da	BLOOD	1.2	
337	8-903218	2	PbAc	75		3.7	3	a:pig26.da	BLOOD	3.7	
340	8-903213	2	PbAc	75		2.7	3	a:pig26.da	BLOOD	2.7	
313	8-903228	3	PbAc	225		8.1	3	a:pig26.da	BLOOD	8.1	
315	8-903253	3	PbAc	225		4.3	3	a:pig26.da	BLOOD	4.3	
342	8-903234	3	PbAc	225		9.2	3	a:pig26.da	BLOOD	9.2	
354	8-903222	3	PbAc	225		4.4	3	a:pig26.da	BLOOD	4.4	
356	8-903250	3	PbAc	225	<	1	3	a:pig26.da	BLOOD	0.5	
305	8-903216	4	HL Smelter	75		2.1	3	a:pig26.da	BLOOD	2.1	
311	8-903219	4	HL Smelter	75		1.5	3	a:pig26.da	BLOOD	1.5	
318	8-903214	4	HL Smelter	75		1.1	3	a:pig26.da	BLOOD	1.1	
321	8-903260	4	HL Smelter	75		1.6	3	a:pig26.da	BLOOD	1.6	
331	8-903252	4	HL Smelter	75		1.2	3	a:pig26.da	BLOOD	1.2	
316	8-903231	5	HL Smelter	225		1.6	3	a:pig26.da	BLOOD	1.6	
317	8-903246	5	HL Smelter	225		2.6	3	a:pig26.da	BLOOD	2.6	
330	8-903247	5	HL Smelter	225		1.6	3	a:pig26.da	BLOOD	1.6	
352	8-903239	5	HL Smelter	225		3.7	3	a:pig26.da	BLOOD	3.7	
353	8-903255	5	HL Smelter	225		4.1	3	a:pig26.da	BLOOD	4.1	
319	8-903251	6	HL Smelter	675		7.6	3	a:pig26.da	BLOOD	7.6	
341	8-903217	6	HL Smelter	675		7.2	3	a:pig26.da	BLOOD	7.2	
344	8-903241	6	HL Smelter	675		6.3	3	a:pig26.da	BLOOD	6.3	
345	8-903233	6	HL Smelter	675		9.5	3	a:pig26.da	BLOOD	9.5	
348	8-903232	6	HL Smelter	675		11	3	a:pig26.da	BLOOD	11	
325	8-903224	7	LL Yard	75		2.9	3	a:pig26.da	BLOOD	2.9	
329	8-903220	7	LL Yard	75	<	1	3	a:pig26.da	BLOOD	0.5	
338	8-903235	7	LL Yard	75		1.2	3	a:pig26.da	BLOOD	1.2	
343	8-903261	7	LL Yard	75	<	1	3	a:pig26.da	BLOOD	0.5	
351	8-903244	7	LL Yard	75	<	1	3	a:pig26.da	BLOOD	0.5	
302	8-903215	8	LL Yard	225	<	1	3	a:pig26.da	BLOOD	0.5	
326	8-903223	8	LL Yard	225		2.5	3	a:pig26.da	BLOOD	2.5	
328	8-903256	8	LL Yard	225		8.3	3	a:pig26.da	BLOOD	8.3	
332	8-903242	8	LL Yard	225		9.3	3	a:pig26.da	BLOOD	9.3	
346	8-903249	8	LL Yard	225		1.4	3	a:pig26.da	BLOOD	1.4	
306	8-903226	9	LL Yard	675		5.7	3	a:pig26.da	BLOOD	5.7	
333	8-903248	9	LL Yard	675		5.2	3	a:pig26.da	BLOOD	5.2	
334	8-903221	9	LL Yard	675		13.9	3	a:pig26.da	BLOOD	13.9	
335	8-903240	9	LL Yard	675		8.3	3	a:pig26.da	BLOOD	8.3	
349	8-903262	9	LL Yard	675		8.7	3	a:pig26.da	BLOOD	8.7	
307	8-903257	10	IV-100	100		11.5	3	a:pig26.da	BLOOD	11.5	
320	8-903258	10	IV-100	100		11	3	a:pig26.da	BLOOD	11	
322	8-903236	10	IV-100	100		13.3	3	a:pig26.da	BLOOD	13.3	
347	8-903225	10	IV-100	100		11.4	3	a:pig26.da	BLOOD	11.4	
350	8-903230	10	IV-100	100		9.8	3	a:pig26.da	BLOOD	9.8	
304	8-903309	1	control	0	<	1	5	a:pig26.da	BLOOD	0.5	
339	8-903266	1	control	0	<	1	5	a:pig26.da	BLOOD	0.5	
309	8-903280	2	PbAc	75		1.6	5	a:pig26.da	BLOOD	1.6	
312	8-903311	2	PbAc	75		3	5	a:pig26.da	BLOOD	3	
324	8-903310	2	PbAc	75		1.9	5	a:pig26.da	BLOOD	1.9	
337	8-903268	2	PbAc	75		3.9	5	a:pig26.da	BLOOD	3.9	
340	8-903270	2	PbAc	75		3.8	5	a:pig26.da	BLOOD	3.8	
313	8-903288	3	PbAc	225		8.7	5	a:pig26.da	BLOOD	8.7	
315	8-903277	3	PbAc	225		8.8	5	a:pig26.da	BLOOD	8.8	
342	8-903302	3	PbAc	225		8.1	5	a:pig26.da	BLOOD	8.1	
354	8-903292	3	PbAc	225		6.7	5	a:pig26.da	BLOOD	6.7	
356	8-903276	3	PbAc	225		1.7	5	a:pig26.da	BLOOD	1.7	
305	8-903308	4	HL Smelter	75		1.9	5	a:pig26.da	BLOOD	1.9	
311	8-903269	4	HL Smelter	75		3.1	5	a:pig26.da	BLOOD	3.1	
318	8-903314	4	HL Smelter	75		2.7	5	a:pig26.da	BLOOD	2.7	
321	8-903299	4	HL Smelter	75		2.4	5	a:pig26.da	BLOOD	2.4	
331	8-903303	4	HL Smelter	75		1.2	5	a:pig26.da	BLOOD	1.2	
316	8-903289	5	HL Smelter	225		3.6	5	a:pig26.da	BLOOD	3.6	
317	8-903300	5	HL Smelter	225		4	5	a:pig26.da	BLOOD	4	
330	8-903297	5	HL Smelter	225		1.4	5	a:pig26.da	BLOOD	1.4	
352	8-903279	5	HL Smelter	225		5	5	a:pig26.da	BLOOD	5	
353	8-903293	5	HL Smelter	225		3.6	5	a:pig26.da	BLOOD	3.6	
319	8-903264	6	HL Smelter	675		9.6	5	a:pig26.da	BLOOD	9.6	
341	8-903284	6	HL Smelter	675		6.9	5	a:pig26.da	BLOOD	6.9	
344	8-903301	6	HL Smelter	675		7.8	5	a:pig26.da	BLOOD	7.8	
345	8-903274	6	HL Smelter	675		10.1	5	a:pig26.da	BLOOD	10.1	
348	8-903278	6	HL Smelter	675		10.3	5	a:pig26.da	BLOOD	10.3	
325	8-903286	7	LL Yard	75		3.2	5	a:pig26.da	BLOOD	3.2	
329	8-903271	7	LL Yard	75		1.8	5	a:pig26.da	BLOOD	1.8	
338	8-903294	7	LL Yard	75		2	5	a:pig26.da	BLOOD	2	
343	8-903265	7	LL Yard	75		1.9	5	a:pig26.da	BLOOD	1.9	
351	8-903312	7	LL Yard	75		2	5	a:pig26.da	BLOOD	2	
302	8-903285	8	LL Yard	225		1.3	5	a:pig26.da	BLOOD	1.3	
326	8-903287	8	LL Yard	225		4.3	5	a:pig26.da	BLOOD	4.3	
328	8-903267	8	LL Yard	225		8.1	5	a:pig26.da	BLOOD	8.1	

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)*	Notes
332	8-903290	8	LL Yard	225		7.5	5	a:pig26.da	BLOOD	7.5	
346	8-903305	8	LL Yard	225		1.4	5	a:pig26.da	BLOOD	1.4	
306	8-903272	9	LL Yard	675		7.3	5	a:pig26.da	BLOOD	7.3	
333	8-903298	9	LL Yard	675		9.3	5	a:pig26.da	BLOOD	9.3	
334	8-903283	9	LL Yard	675		15	5	a:pig26.da	BLOOD	15	
335	8-903281	9	LL Yard	675		10.6	5	a:pig26.da	BLOOD	10.6	
349	8-903307	9	LL Yard	675		8.6	5	a:pig26.da	BLOOD	8.6	
307	8-903304	10	IV-100	100		15.4	5	a:pig26.da	BLOOD	15.4	
320	8-903295	10	IV-100	100		12	5	a:pig26.da	BLOOD	12	
322	8-903306	10	IV-100	100		11.1	5	a:pig26.da	BLOOD	11.1	
347	8-903296	10	IV-100	100		12	5	a:pig26.da	BLOOD	12	
350	8-903273	10	IV-100	100		12.3	5	a:pig26.da	BLOOD	12.3	
304	8-903341	1	control	0	<	1	7	a:pig26.da	BLOOD	0.5	
339	8-903353	1	control	0	<	1	7	a:pig26.da	BLOOD	0.5	
309	8-903356	2	PbAc	75		1.6	7	a:pig26.da	BLOOD	1.6	
312	8-903336	2	PbAc	75		4.1	7	a:pig26.da	BLOOD	4.1	
324	8-903320	2	PbAc	75		2.5	7	a:pig26.da	BLOOD	2.5	
337	8-903321	2	PbAc	75		4.1	7	a:pig26.da	BLOOD	4.1	
340	8-903361	2	PbAc	75		5.1	7	a:pig26.da	BLOOD	5.1	
313	8-903335	3	PbAc	225		8.3	7	a:pig26.da	BLOOD	8.3	
315	8-903326	3	PbAc	225		6.4	7	a:pig26.da	BLOOD	6.4	
342	8-903334	3	PbAc	225		8.7	7	a:pig26.da	BLOOD	8.7	
354	8-903345	3	PbAc	225		7.1	7	a:pig26.da	BLOOD	7.1	
356	8-903323	3	PbAc	225		3.1	7	a:pig26.da	BLOOD	3.1	
305	8-903333	4	HL Smelter	75		2.2	7	a:pig26.da	BLOOD	2.2	
311	8-903343	4	HL Smelter	75		2.9	7	a:pig26.da	BLOOD	2.9	
318	8-903327	4	HL Smelter	75		4	7	a:pig26.da	BLOOD	4	
321	8-903340	4	HL Smelter	75		3.2	7	a:pig26.da	BLOOD	3.2	
331	8-903315	4	HL Smelter	75		2.1	7	a:pig26.da	BLOOD	2.1	
316	8-903351	5	HL Smelter	225		5.7	7	a:pig26.da	BLOOD	5.7	
317	8-903331	5	HL Smelter	225		5.1	7	a:pig26.da	BLOOD	5.1	
330	8-903337	5	HL Smelter	225		5	7	a:pig26.da	BLOOD	5	
352	8-903339	5	HL Smelter	225		6	7	a:pig26.da	BLOOD	6	
353	8-903318	5	HL Smelter	225		3.4	7	a:pig26.da	BLOOD	3.4	
319	8-903358	6	HL Smelter	675		11.6	7	a:pig26.da	BLOOD	11.6	
341	8-903330	6	HL Smelter	675		9.7	7	a:pig26.da	BLOOD	9.7	
344	8-903322	6	HL Smelter	675		9.9	7	a:pig26.da	BLOOD	9.9	
345	8-903325	6	HL Smelter	675		12.6	7	a:pig26.da	BLOOD	12.6	
348	8-903355	6	HL Smelter	675		12.9	7	a:pig26.da	BLOOD	12.9	
325	8-903360	7	LL Yard	75		4.3	7	a:pig26.da	BLOOD	4.3	
329	8-903350	7	LL Yard	75		4.4	7	a:pig26.da	BLOOD	4.4	
338	8-903362	7	LL Yard	75		4.1	7	a:pig26.da	BLOOD	4.1	
343	8-903332	7	LL Yard	75		2.7	7	a:pig26.da	BLOOD	2.7	
351	8-903352	7	LL Yard	75		3.2	7	a:pig26.da	BLOOD	3.2	
302	8-903328	8	LL Yard	225		2.4	7	a:pig26.da	BLOOD	2.4	
326	8-903342	8	LL Yard	225		4.4	7	a:pig26.da	BLOOD	4.4	
328	8-903357	8	LL Yard	225		9.3	7	a:pig26.da	BLOOD	9.3	
332	8-903348	8	LL Yard	225		7.2	7	a:pig26.da	BLOOD	7.2	
346	8-903364	8	LL Yard	225		4	7	a:pig26.da	BLOOD	4	
306	8-903365	9	LL Yard	675		10.5	7	a:pig26.da	BLOOD	10.5	
333	8-903346	9	LL Yard	675		12.2	7	a:pig26.da	BLOOD	12.2	
334	8-903329	9	LL Yard	675		16.4	7	a:pig26.da	BLOOD	16.4	
335	8-903344	9	LL Yard	675		14.3	7	a:pig26.da	BLOOD	14.3	
349	8-903347	9	LL Yard	675		10.1	7	a:pig26.da	BLOOD	10.1	
307	8-903349	10	IV-100	100		16.4	7	a:pig26.da	BLOOD	16.4	
320	8-903354	10	IV-100	100		14.8	7	a:pig26.da	BLOOD	14.8	
322	8-903338	10	IV-100	100		12.4	7	a:pig26.da	BLOOD	12.4	
347	8-903359	10	IV-100	100		12.5	7	a:pig26.da	BLOOD	12.5	
350	8-903363	10	IV-100	100		13.1	7	a:pig26.da	BLOOD	13.1	
304	8-903402	1	control	0	<	1	9	a:pig25.da	BLOOD	0.5	
339	8-903395	1	control	0	<	1	9	a:pig25.da	BLOOD	0.5	
309	8-903386	2	PbAc	75		2	9	a:pig25.da	BLOOD	2	
312	8-903404	2	PbAc	75		4.9	9	a:pig25.da	BLOOD	4.9	
324	8-903372	2	PbAc	75		3.1	9	a:pig25.da	BLOOD	3.1	
337	8-903407	2	PbAc	75		4.5	9	a:pig25.da	BLOOD	4.5	
340	8-903414	2	PbAc	75		4.6	9	a:pig25.da	BLOOD	4.6	
313	8-903400	3	PbAc	225		8.9	9	a:pig25.da	BLOOD	8.9	
315	8-903413	3	PbAc	225		6.9	9	a:pig25.da	BLOOD	6.9	
342	8-903371	3	PbAc	225		12.4	9	a:pig25.da	BLOOD	12.4	
354	8-903389	3	PbAc	225		6.8	9	a:pig25.da	BLOOD	6.8	
356	8-903377	3	PbAc	225		4.5	9	a:pig25.da	BLOOD	4.5	
305	8-903399	4	HL Smelter	75		2.5	9	a:pig25.da	BLOOD	2.5	
311	8-903378	4	HL Smelter	75		3.6	9	a:pig25.da	BLOOD	3.6	
318	8-903397	4	HL Smelter	75		3.3	9	a:pig25.da	BLOOD	3.3	
321	8-903415	4	HL Smelter	75		3.3	9	a:pig25.da	BLOOD	3.3	
331	8-903403	4	HL Smelter	75		2.5	9	a:pig25.da	BLOOD	2.5	
316	8-903401	5	HL Smelter	225		6	9	a:pig25.da	BLOOD	6	
317	8-903391	5	HL Smelter	225		6.3	9	a:pig25.da	BLOOD	6.3	
330	8-903411	5	HL Smelter	225		5.8	9	a:pig25.da	BLOOD	5.8	
352	8-903366	5	HL Smelter	225		7.6	9	a:pig25.da	BLOOD	7.6	
353	8-903416	5	HL Smelter	225		4.3	9	a:pig25.da	BLOOD	4.3	
319	8-903408	6	HL Smelter	675		10.7	9	a:pig25.da	BLOOD	10.7	
341	8-903379	6	HL Smelter	675		9.9	9	a:pig25.da	BLOOD	9.9	
344	8-903382	6	HL Smelter	675		11.6	9	a:pig25.da	BLOOD	11.6	
345	8-903393	6	HL Smelter	675		11.3	9	a:pig25.da	BLOOD	11.3	
348	8-903370	6	HL Smelter	675		14.8	9	a:pig25.da	BLOOD	14.8	
325	8-903390	7	LL Yard	75		4.5	9	a:pig25.da	BLOOD	4.5	
329	8-903387	7	LL Yard	75		4.4	9	a:pig25.da	BLOOD	4.4	
338	8-903373	7	LL Yard	75		5.8	9	a:pig25.da	BLOOD	5.8	
343	8-903367	7	LL Yard	75		2.8	9	a:pig25.da	BLOOD	2.8	
351	8-903405	7	LL Yard	75		4.1	9	a:pig25.da	BLOOD	4.1	
302	8-903381	8	LL Yard	225		4.7	9	a:pig25.da	BLOOD	4.7	
326	8-903398	8	LL Yard	225		7.5	9	a:pig25.da	BLOOD	7.5	
328	8-903410	8	LL Yard	225		10.8	9	a:pig25.da	BLOOD	10.8	
332	8-903392	8	LL Yard	225		7.9	9	a:pig25.da	BLOOD	7.9	

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pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)[a]	Notes
346	8-903374	8	LL Yard	225		6.4	9	a:pig25.da	BLOOD	6.4	
306	8-903369	9	LL Yard	675		11	9	a:pig25.da	BLOOD	11	
333	8-903384	9	LL Yard	675		9.7	9	a:pig25.da	BLOOD	9.7	
334	8-903412	9	LL Yard	675		14.6	9	a:pig25.da	BLOOD	14.6	
335	8-903394	9	LL Yard	675		13	9	a:pig25.da	BLOOD	13	
349	8-903388	9	LL Yard	675		10.3	9	a:pig25.da	BLOOD	10.3	
307	8-903380	10	IV-100	100		17	9	a:pig25.da	BLOOD	17	
320	8-903383	10	IV-100	100		14.6	9	a:pig25.da	BLOOD	14.6	
322	8-903406	10	IV-100	100			9		BLOOD		Died
347	8-903375	10	IV-100	100		13.6	9	a:pig25.da	BLOOD	13.6	
350	8-903376	10	IV-100	100		13	9	a:pig25.da	BLOOD	13	
304	8-903429	1	control	0	<	1	12	a:pig25.da	BLOOD	0.5	
339	8-903435	1	control	0	<	1	12	a:pig25.da	BLOOD	0.5	
309	8-903420	2	PbAc	75		3.3	12	a:pig25.da	BLOOD	3.3	
312	8-903460	2	PbAc	75		5.3	12	a:pig25.da	BLOOD	5.3	
324	8-903445	2	PbAc	75		6.4	12	a:pig25.da	BLOOD	6.4	
337	8-903427	2	PbAc	75		5.1	12	a:pig25.da	BLOOD	5.1	
340	8-903454	2	PbAc	75		5.2	12	a:pig25.da	BLOOD	5.2	
313	8-903432	3	PbAc	225		10.1	12	a:pig25.da	BLOOD	10.1	
315	8-903431	3	PbAc	225		9.9	12	a:pig25.da	BLOOD	9.9	
342	8-903436	3	PbAc	225		12.8	12	a:pig25.da	BLOOD	12.8	
354	8-903455	3	PbAc	225		8.4	12	a:pig25.da	BLOOD	8.4	
356	8-903443	3	PbAc	225		7.3	12	a:pig25.da	BLOOD	7.3	
305	8-903433	4	HL Smelter	75		2.7	12	a:pig25.da	BLOOD	2.7	
311	8-903434	4	HL Smelter	75		4.8	12	a:pig25.da	BLOOD	4.8	
318	8-903441	4	HL Smelter	75		4.9	12	a:pig25.da	BLOOD	4.9	
321	8-903465	4	HL Smelter	75		5.5	12	a:pig25.da	BLOOD	5.5	
331	8-903439	4	HL Smelter	75		3.7	12	a:pig25.da	BLOOD	3.7	
316	8-903426	5	HL Smelter	225		8.6	12	a:pig25.da	BLOOD	8.6	
317	8-903458	5	HL Smelter	225		8.4	12	a:pig25.da	BLOOD	8.4	
330	8-903464	5	HL Smelter	225		6.7	12	a:pig25.da	BLOOD	6.7	
352	8-903437	5	HL Smelter	225		8	12	a:pig25.da	BLOOD	8	
353	8-903419	5	HL Smelter	225		5.2	12	a:pig25.da	BLOOD	5.2	
319	8-903463	6	HL Smelter	675		13.2	12	a:pig25.da	BLOOD	13.2	
341	8-903453	6	HL Smelter	675		11	12	a:pig25.da	BLOOD	11	
344	8-903446	6	HL Smelter	675		13.9	12	a:pig25.da	BLOOD	13.9	
345	8-903423	6	HL Smelter	675		13.1	12	a:pig25.da	BLOOD	13.1	
348	8-903442	6	HL Smelter	675		14.7	12	a:pig25.da	BLOOD	14.7	
325	8-903457	7	LL Yard	75		6.3	12	a:pig25.da	BLOOD	6.3	
329	8-903462	7	LL Yard	75		6	12	a:pig25.da	BLOOD	6	
338	8-903459	7	LL Yard	75		7.4	12	a:pig25.da	BLOOD	7.4	
343	8-903428	7	LL Yard	75		4.4	12	a:pig25.da	BLOOD	4.4	
351	8-903456	7	LL Yard	75		4.4	12	a:pig25.da	BLOOD	4.4	
302	8-903418	8	LL Yard	225		6.3	12	a:pig25.da	BLOOD	6.3	
326	8-903449	8	LL Yard	225		8.1	12	a:pig25.da	BLOOD	8.1	
328	8-903424	8	LL Yard	225		13.8	12	a:pig25.da	BLOOD	13.8	
332	8-903440	8	LL Yard	225		8.7	12	a:pig25.da	BLOOD	8.7	
346	8-903451	8	LL Yard	225		8.5	12	a:pig25.da	BLOOD	8.5	
306	8-903421	9	LL Yard	675		12.2	12	a:pig25.da	BLOOD	12.2	
333	8-903417	9	LL Yard	675		11.6	12	a:pig25.da	BLOOD	11.6	
334	8-903452	9	LL Yard	675		14.6	12	a:pig25.da	BLOOD	14.6	
335	8-903467	9	LL Yard	675		15.6	12	a:pig25.da	BLOOD	15.6	
349	8-903438	9	LL Yard	675		11.4	12	a:pig25.da	BLOOD	11.4	
307	8-903466	10	IV-100	100		16.5	12	a:pig25.da	BLOOD	16.5	
320	8-903461	10	IV-100	100		15.5	12	a:pig25.da	BLOOD	15.5	
322	8-903430	10	IV-100	100			12		BLOOD		Died
347	8-903447	10	IV-100	100		13.4	12	a:pig25.da	BLOOD	13.4	
350	8-903422	10	IV-100	100		14	12	a:pig25.da	BLOOD	14	
304	8-903486	1	control	0	<	1	15	a:pig25.da	BLOOD	0.5	
339	8-903499	1	control	0	<	1	15	a:pig25.da	BLOOD	0.5	
309	8-903489	2	PbAc	75		3.9	15	a:pig25.da	BLOOD	3.9	
312	8-903473	2	PbAc	75		5.8	15	a:pig25.da	BLOOD	5.8	
324	8-903508	2	PbAc	75		5.5	15	a:pig25.da	BLOOD	5.5	
337	8-903513	2	PbAc	75		6.5	15	a:pig25.da	BLOOD	6.5	
340	8-903517	2	PbAc	75		6.1	15	a:pig25.da	BLOOD	6.1	
313	8-903502	3	PbAc	225		11.4	15	a:pig25.da	BLOOD	11.4	
315	8-903516	3	PbAc	225		10.8	15	a:pig25.da	BLOOD	10.8	
342	8-903501	3	PbAc	225		13.1	15	a:pig25.da	BLOOD	13.1	
354	8-903483	3	PbAc	225		7.4	15	a:pig25.da	BLOOD	7.4	
356	8-903482	3	PbAc	225		8.1	15	a:pig25.da	BLOOD	8.1	
305	8-903481	4	HL Smelter	75		3.4	15	a:pig25.da	BLOOD	3.4	
311	8-903506	4	HL Smelter	75		3.4	15	a:pig25.da	BLOOD	3.4	
318	8-903472	4	HL Smelter	75		4.8	15	a:pig25.da	BLOOD	4.8	
321	8-903471	4	HL Smelter	75		5.6	15	a:pig25.da	BLOOD	5.6	
331	8-903496	4	HL Smelter	75		4.5	15	a:pig25.da	BLOOD	4.5	
316	8-903509	5	HL Smelter	225		8.3	15	a:pig25.da	BLOOD	8.3	
317	8-903476	5	HL Smelter	225		8.1	15	a:pig25.da	BLOOD	8.1	
330	8-903505	5	HL Smelter	225		8	15	a:pig25.da	BLOOD	8	
352	8-903479	5	HL Smelter	225		8.2	15	a:pig25.da	BLOOD	8.2	
353	8-903492	5	HL Smelter	225		5.4	15	a:pig25.da	BLOOD	5.4	
319	8-903480	6	HL Smelter	675		12.5	15	a:pig25.da	BLOOD	12.5	
341	8-903475	6	HL Smelter	675		9.9	15	a:pig25.da	BLOOD	9.9	
344	8-903500	6	HL Smelter	675		13.3	15	a:pig25.da	BLOOD	13.3	
345	8-903478	6	HL Smelter	675		13.3	15	a:pig25.da	BLOOD	13.3	
348	8-903515	6	HL Smelter	675		16.5	15	a:pig25.da	BLOOD	16.5	
325	8-903514	7	LL Yard	75		5.7	15	a:pig25.da	BLOOD	5.7	
329	8-903490	7	LL Yard	75		5.1	15	a:pig25.da	BLOOD	5.1	
338	8-903497	7	LL Yard	75		8.1	15	a:pig25.da	BLOOD	8.1	
343	8-903518	7	LL Yard	75		5.2	15	a:pig25.da	BLOOD	5.2	
351	8-903487	7	LL Yard	75		5.1	15	a:pig25.da	BLOOD	5.1	
302	8-903495	8	LL Yard	225		8	15	a:pig25.da	BLOOD	8	
326	8-903474	8	LL Yard	225		10.2	15	a:pig25.da	BLOOD	10.2	
328	8-903491	8	LL Yard	225		14.7	15	a:pig25.da	BLOOD	14.7	
332	8-903494	8	LL Yard	225		8.9	15	a:pig25.da	BLOOD	8.9	
346	8-903510	8	LL Yard	225		10.9	15	a:pig25.da	BLOOD	10.9	

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)[a]	Notes
306	8-903504	9	LL Yard	675		14.1	15	a:pig25.da	BLOOD	14.1	
333	8-903485	9	LL Yard	675		15.8	15	a:pig25.da	BLOOD	15.8	
334	8-903493	9	LL Yard	675		15.9	15	a:pig25.da	BLOOD	15.9	
335	8-903503	9	LL Yard	675		16.5	15	a:pig25.da	BLOOD	16.5	
349	8-903512	9	LL Yard	675		12.2	15	a:pig25.da	BLOOD	12.2	
307	8-903498	10	IV-100	100		17.3	15	a:pig25.da	BLOOD	17.3	
320	8-903484	10	IV-100	100		16.5	15	a:pig25.da	BLOOD	16.5	
322	8-903488	10	IV-100	100			15		BLOOD		Died
347	8-903470	10	IV-100	100		13.7	15	a:pig25.da	BLOOD	13.7	
350	8-903468	10	IV-100	100		14.2	15	a:pig25.da	BLOOD	14.2	

a Non-detects evaluated using 1/2 the quantitation limit; laboratory results (ug/L) converted to concentration in blood (ug/dL) by dividing by dilution factor of 1 dL/L

TABLE A-4 BLOOD LEAD OUTLIERS

Flagged Data Points
Outliers (none selected)

test material	target dosage	Actual Dose*	group	pig#	BLOOD LEAD (ug/dL) BY DAY -4	0	1	2	3	5	7	9	12	15
Control	0	0.00	1	304	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Control	0	0.00	1	339	Missing	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PbAc	75	75.06	2	309	0.5	0.5	0.5	1.3	2.1	1.6	1.6	2	3.3	3.9
PbAc	75	72.63	2	312	1	0.5	1.7	2.5	1.9	3	4.1	4.9	5.3	5.8
PbAc	75	75.99	2	324	0.5	0.5	1.1	1.1	1.2	1.9	2.5	3.1	6.4	5.5
PbAc	75	73.99	2	337	0.5	0.5	0.5	2.2	3.7	3.9	4.1	4.5	5.1	6.5
PbAc	75	82.01	2	340	1.1	0.5	2	2.1	2.7	3.8	5.1	4.6	5.2	6.1
PbAc	225	272.00	3	313	0.5	0.5	6.4	7.1	8.1	8.7	8.3	8.9	10.1	11.4
PbAc	225	237.95	3	315	0.5	0.5	0.5	3.4	4.3	8.8	6.4	6.9	9.9	10.8
PbAc	225	233.07	3	342	1	0.5	6.6	7.3	8.2	8.1	8.7	12.4	12.8	13.1
PbAc	225	258.78	3	354	0.5	0.5	3.1	3.4	4.4	6.7	7.1	6.8	8.4	7.4
PbAc	225	233.42	3	356	0.5	0.5	0.5	0.5	0.5	1.7	3.1	4.8	7.3	8.1
HL Smelter	75	81.05	4	305	0.5	0.5	0.5	0.5	2.1	1.9	2.2	2.5	2.7	3.4
HL Smelter	75	77.89	4	311	0.5	0.5	1.3	1.3	1.5	3.1	2.9	3.6	4.8	3.4
HL Smelter	75	74.23	4	318	0.5	0.5	0.5	0.5	1.1	2.7	4	3.3	4.9	4.8
HL Smelter	75	68.99	4	321	1.1	0.5	0.5	2	1.6	2.4	3.2	3.3	5.5	5.6
HL Smelter	75	81.68	4	331	0.5	0.5	0.5	0.5	1.2	1.2	2.1	2.5	3.7	4.5
HL Smelter	225	240.26	5	316	1.1	0.5	0.5	0.5	1.6	3.6	5.7	6	8.6	8.3
HL Smelter	225	210.01	5	317	0.5	0.5	0.5	2.7	2.6	4	5.1	6.3	8.4	8.1
HL Smelter	225	218.94	5	330	0.5	0.5	1.5	2.5	1.6	1.4	5	5.8	6.7	8
HL Smelter	225	232.96	5	352	0.5	0.5	2	4.2	3.7	5	6	7.6	8	8.2
HL Smelter	225	232.82	5	353	0.5	0.5	2.5	3.7	4.1	3.6	3.4	4.3	5.2	5.4
HL Smelter	675	768.28	6	319	0.5	0.5	5	7.4	7.6	9.6	11.6	10.7	13.2	12.5
HL Smelter	675	778.28	6	341	0.5	0.5	2.4	6.3	7.2	6.9	9.7	9.9	11	9.9
HL Smelter	675	685.96	6	344	0.5	0.5	3.2	4.6	6.3	7.8	9.9	11.6	13.9	13.3
HL Smelter	675	716.77	6	345	0.5	0.5	8.2	9	9.5	10.1	12.6	11.3	13.1	13.3
HL Smelter	675	762.20	6	348	0.5	0.5	3.2	9.8	11	10.3	12.9	14.8	14.7	16.5
LL Yard	75	67.39	7	325	0.5	0.5	2.1	1.9	2.9	3.2	4.3	4.5	6.3	5.7
LL Yard	75	72.28	7	329	0.5	0.5	0.5	0.5	0.5	1.8	4.4	4.4	6	5.1
LL Yard	75	80.52	7	338	0.5	0.5	0.5	0.5	1.2	2	4.1	5.8	7.4	8.1
LL Yard	75	78.76	7	343	0.5	0.5	0.5	0.5	0.5	1.9	2.7	2.8	4.4	5.2
LL Yard	75	75.99	7	351	0.5	0.5	0.5	1.1	0.5	2	3.2	4.1	4.4	5.1
LL Yard	225	222.86	8	302	0.5	0.5	0.5	0.5	0.5	1.3	2.4	4.7	6.3	8
LL Yard	225	215.94	8	326	0.5	0.5	0.5	1.6	2.5	4.3	4.4	7.5	8.1	10.2
LL Yard	225	198.72	8	328	0.5	0.5	7.4	9.5	8.3	8.1	9.3	10.8	13.8	14.7
LL Yard	225	258.51	8	332	1	0.5	7.5	9.8	9.3	7.5	7.2	7.9	8.7	8.9
LL Yard	225	260.69	8	346	0.5	0.5	1	1.3	1.4	1.4	4	6.4	8.5	10.9
LL Yard	675	665.91	9	306	0.5	0.5	2.5	4	5.7	7.3	10.5	11	12.2	14.1
LL Yard	675	691.38	9	333	0.5	0.5	2	3.2	5.2	9.3	12.2	9.7	11.6	15.8
LL Yard	675	683.70	9	334	0.5	0.5	10.7	13.8	12.9	15	16.4	14.6	14.6	15.9
LL Yard	675	723.33	9	335	0.5	0.5	7.4	7.8	8.3	10.6	14.3	13	15.6	16.5
LL Yard	675	664.82	9	349	0.5	0.5	7.1	7.5	8.7	8.6	10.1	10.3	11.4	12.2
IV	100	94.54	10	307	0.5	0.5	10.6	Missing	11.5	15.4	16.4	17	16.5	17.3
IV	100	96.91	10	320	0.5	0.5	9.8	10.9	11	12	14.8	14.6	15.5	16.5
IV	100	0.00	10	322										
IV	100	108.55	10	347	0.5	0.5	8.6	10.1	11.4	12	12.5	13.6	13.4	13.7
IV	100	109.88	10	350	0.5	0.5	7.4	9	9.8	12.3	13.1	13	14	14.2

*** Average Time and Weight-Adjusted Dose for Each Pig**

Animal removed during course of study

TABLE A-5 RATIONALE FOR PbB OUTLIER DECISIONS

No PbB Outliers Selected for this Study

TABLE A-6 Area Under Curve Determinations

Calculated using interpolated values for missing or excluded data

		AUC (ug/dL-days) For Time Span Shown								
group	pig#	0-1	1-2	2-3	3-5	5-7	7-9	9-12	12-15	AUC Total (ug/dL-days)
1	304	0.50	0.50	0.50	1.00	1.00	1.00	1.50	1.50	7.50
1	339	0.50	0.50	0.50	1.00	1.00	1.00	1.50	1.50	7.50
2	309	0.50	0.90	1.70	3.70	3.20	3.60	7.95	10.80	32.35
2	312	1.10	2.10	2.20	4.90	7.10	9.00	15.30	16.65	58.35
2	324	0.80	1.10	1.15	3.10	4.40	5.60	14.25	17.85	48.25
2	337	0.50	1.35	2.95	7.60	8.00	8.60	14.40	17.40	60.80
2	340	1.25	2.05	2.40	6.50	8.90	9.70	14.70	16.95	62.45
3	313	3.45	6.75	7.60	16.80	17.00	17.20	28.50	32.25	129.55
3	315	0.50	1.95	3.85	13.10	15.20	13.30	25.20	31.05	104.15
3	342	3.65	7.05	8.25	17.30	16.80	21.10	37.80	38.85	150.80
3	354	1.80	3.25	3.90	11.10	13.80	13.90	22.80	23.70	94.25
3	356	0.50	0.50	0.50	2.20	4.80	7.60	17.70	23.10	56.90
4	305	0.50	0.50	1.30	4.00	4.10	4.70	7.80	9.15	32.05
4	311	0.90	1.30	1.40	4.60	6.00	6.50	12.60	12.30	45.60
4	318	0.50	0.50	0.80	3.80	6.70	7.30	12.30	14.55	46.45
4	321	0.50	1.25	1.80	4.00	5.60	6.50	13.20	16.65	49.50
4	331	0.50	0.50	0.85	2.40	3.30	4.60	9.30	12.30	33.75
5	316	0.50	0.50	1.05	5.20	9.30	11.70	21.90	25.35	75.50
5	317	0.50	1.60	2.65	6.60	9.10	11.40	22.05	24.75	78.65
5	330	1.00	2.00	2.05	3.00	6.40	10.80	18.75	22.05	66.05
5	352	1.25	3.10	3.95	8.70	11.00	13.60	23.40	24.30	89.30
5	353	1.50	3.10	3.90	7.70	7.00	7.70	14.25	15.90	61.05
6	319	2.75	6.20	7.50	17.20	21.20	22.30	35.85	38.55	151.55
6	341	1.45	4.35	6.75	14.10	16.60	19.60	31.35	31.35	125.55
6	344	1.85	3.90	5.45	14.10	17.70	21.50	38.25	40.80	143.55
6	345	4.85	9.10	9.25	19.60	22.70	23.90	36.60	39.60	165.60
6	348	1.85	6.50	10.40	21.30	23.20	27.70	44.25	46.80	182.00
7	325	1.30	2.00	2.40	6.10	7.50	8.80	16.20	18.00	62.30
7	329	0.50	0.50	0.50	2.30	6.20	8.80	15.60	16.65	51.05
7	338	0.50	0.50	0.85	3.20	6.10	9.90	19.80	23.25	64.10
7	343	0.50	0.50	0.50	2.40	4.60	5.50	10.80	14.40	39.20
7	351	0.50	0.80	0.80	2.50	5.20	7.30	12.75	14.25	44.10
8	302	0.50	0.50	0.50	1.80	3.70	7.10	16.50	21.45	52.05
8	326	0.50	1.05	2.05	6.80	8.70	11.90	23.40	27.45	81.85
8	328	3.95	8.45	8.90	16.40	17.40	20.10	36.90	42.75	154.85
8	332	4.00	8.65	9.55	16.80	14.70	15.10	24.90	26.40	120.10
8	346	0.75	1.15	1.35	2.80	5.40	10.40	22.35	29.10	73.30
9	306	1.50	3.25	4.85	13.00	17.80	21.50	34.80	39.45	136.15
9	333	1.25	2.60	4.20	14.50	21.50	21.90	31.95	41.10	139.00
9	334	5.60	12.25	13.85	28.90	31.40	31.00	43.80	45.75	212.55
9	335	3.95	7.60	8.05	18.90	24.90	27.30	42.90	48.15	181.75
9	349	3.80	7.30	8.10	17.30	18.70	20.40	32.55	35.40	143.55
10	307	5.55	10.83	11.28	26.90	31.80	33.40	50.25	50.70	220.70
10	320	5.15	10.35	10.95	23.00	26.80	29.40	45.15	48.00	198.80
10	322									
10	347	4.55	9.35	10.75	23.40	24.50	26.10	40.50	40.65	179.80
10	350	3.95	8.20	9.40	22.10	25.40	26.10	40.50	42.30	177.95

Animal removed during course of study

TABLE A - 7 TISSUE LEAD DATA

PHASE II EXPERIMENT 3

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)[b]	day	source file	MATRIX	Adjusted Value[a]	Notes
304	8-903538	1	control	0		2.7	15	a:pig32.da	FEMUR	1.35	
339	8-903547	1	control	0			15		FEMUR		Label error
309	8-903555	2	PbAc	75		10.2	15	a:pig32.da	FEMUR	5.1	
312	8-903562	2	PbAc	75		14.8	15	a:pig32.da	FEMUR	7.4	
324	8-903568	2	PbAc	75		12.9	15	a:pig32.da	FEMUR	6.45	
337	8-903519	2	PbAc	75		14.4	15	a:pig32.da	FEMUR	7.2	
340	8-903545	2	PbAc	75		12.8	15	a:pig32.da	FEMUR	6.4	
313	8-903566	3	PbAc	225		42.2	15	a:pig32.da	FEMUR	21.1	
315	8-903526	3	PbAc	225		30.7	15	a:pig32.da	FEMUR	15.35	
342	8-903548	3	PbAc	225		42.9	15	a:pig32.da	FEMUR	21.45	
354	8-903560	3	PbAc	225		27.1	15	a:pig32.da	FEMUR	13.55	
356	8-903561	3	PbAc	225		30.2	15	a:pig32.da	FEMUR	15.1	
305	8-903549	4	HL Smelter	75		7.7	15	a:pig32.da	FEMUR	3.85	
311	8-903531	4	HL Smelter	75		14.6	15	a:pig32.da	FEMUR	7.3	
318	8-903536	4	HL Smelter	75		7.9	15	a:pig32.da	FEMUR	3.95	
321	8-903521	4	HL Smelter	75		7.9	15	a:pig32.da	FEMUR	3.95	
331	8-903532	4	HL Smelter	75		13.4	15	a:pig32.da	FEMUR	6.7	
316	8-903543	5	HL Smelter	225		25.8	15	a:pig32.da	FEMUR	12.9	
317	8-903565	5	HL Smelter	225		26.3	15	a:pig32.da	FEMUR	13.15	
330	8-903553	5	HL Smelter	225		25.1	15	a:pig32.da	FEMUR	12.55	
352	8-903537	5	HL Smelter	225		26.5	15	a:pig32.da	FEMUR	13.25	
353	8-903558	5	HL Smelter	225		14.6	15	a:pig32.da	FEMUR	7.3	
319	8-903524	6	HL Smelter	675		52.4	15	a:pig32.da	FEMUR	26.2	
341	8-903546	6	HL Smelter	675		49.8	15	a:pig32.da	FEMUR	24.9	
344	8-903523	6	HL Smelter	675		53.6	15	a:pig32.da	FEMUR	26.8	
345	8-903530	6	HL Smelter	675		82.5	15	a:pig32.da	FEMUR	41.25	
348	8-903551	6	HL Smelter	675			15		FEMUR		Label error
325	8-903533	7	LL Yard	75		12.3	15	a:pig32.da	FEMUR	6.15	
329	8-903557	7	LL Yard	75		10.3	15	a:pig32.da	FEMUR	5.15	
338	8-903552	7	LL Yard	75		14.8	15	a:pig32.da	FEMUR	7.4	
343	8-903522	7	LL Yard	75		9.4	15	a:pig32.da	FEMUR	4.7	
351	8-903559	7	LL Yard	75		13.2	15	a:pig32.da	FEMUR	6.6	
302	8-903544	8	LL Yard	225		18.3	15	a:pig32.da	FEMUR	9.15	
326	8-903529	8	LL Yard	225		25.7	15	a:pig32.da	FEMUR	12.85	
328	8-903535	8	LL Yard	225		34.2	15	a:pig32.da	FEMUR	17.1	
332	8-903540	8	LL Yard	225			15		FEMUR		Label error
346	8-903563	8	LL Yard	225		26.4	15	a:pig32.da	FEMUR	13.2	
306	8-903567	9	LL Yard	675		39.3	15	a:pig32.da	FEMUR	19.65	
333	8-903539	9	LL Yard	675			15		FEMUR		Label error
334	8-903550	9	LL Yard	675			15		FEMUR		Label error
335	8-903554	9	LL Yard	675		97.5	15	a:pig32.da	FEMUR	48.75	
349	8-903525	9	LL Yard	675		46.2	15	a:pig32.da	FEMUR	23.1	
301	8-903527	10	IV-100	100			15		FEMUR		Culled
307	8-903564	10	IV-100	100		114	15	a:pig32.da	FEMUR	57	
310	8-903541	10	IV-100	100		122	15	a:pig32.da	FEMUR	61	
320	8-903520	10	IV-100	100		130	15	a:pig32.da	FEMUR	65	
322	8-903542	10	IV-100	100			15		FEMUR		Died
347	8-903556	10	IV-100	100		118	15	a:pig32.da	FEMUR	59	
350	8-903534	10	IV-100	100		114	15	a:pig32.da	FEMUR	57	
355	8-903528	10	IV-100	100		4.8	15	a:pig32.da	FEMUR	2.4	
304	8-903660	1	control	0	<	2	15	a:pig28.da	KIDNEY	10	
339	8-903666	1	control	0	<	2	15	a:pig28.da	KIDNEY	10	
309	8-903657	2	PbAc	75		9.8	15	a:pig28.da	KIDNEY	98	
312	8-903634	2	PbAc	75		25.6	15	a:pig28.da	KIDNEY	256	
324	8-903636	2	PbAc	75		27.4	15	a:pig28.da	KIDNEY	274	
337	8-903646	2	PbAc	75		25.2	15	a:pig28.da	KIDNEY	252	
340	8-903635	2	PbAc	75		16.4	15	a:pig28.da	KIDNEY	164	
313	8-903639	3	PbAc	225		62.4	15	a:pig28.da	KIDNEY	624	
315	8-903668	3	PbAc	225		48	15	a:pig28.da	KIDNEY	480	
342	8-903652	3	PbAc	225		30.2	15	a:pig28.da	KIDNEY	302	
354	8-903651	3	PbAc	225		38	15	a:pig28.da	KIDNEY	380	
356	8-903638	3	PbAc	225		71	15	a:pig28.da	KIDNEY	710	
305	8-903654	4	HL Smelter	75		7.6	15	a:pig28.da	KIDNEY	76	
311	8-903656	4	HL Smelter	75		7.8	15	a:pig28.da	KIDNEY	78	
318	8-903632	4	HL Smelter	75		12.4	15	a:pig28.da	KIDNEY	124	
321	8-903653	4	HL Smelter	75		10	15	a:pig28.da	KIDNEY	100	
331	8-903621	4	HL Smelter	75		13.4	15	a:pig28.da	KIDNEY	134	
316	8-903663	5	HL Smelter	225		29.4	15	a:pig28.da	KIDNEY	294	
317	8-903625	5	HL Smelter	225		28.8	15	a:pig28.da	KIDNEY	288	
330	8-903624	5	HL Smelter	225		43.2	15	a:pig28.da	KIDNEY	432	
352	8-903627	5	HL Smelter	225		44.6	15	a:pig28.da	KIDNEY	446	
353	8-903658	5	HL Smelter	225		16.8	15	a:pig28.da	KIDNEY	168	
319	8-903650	6	HL Smelter	675		61.4	15	a:pig28.da	KIDNEY	614	
341	8-903661	6	HL Smelter	675		53.2	15	a:pig28.da	KIDNEY	532	
344	8-903629	6	HL Smelter	675		77.2	15	a:pig28.da	KIDNEY	772	
345	8-903647	6	HL Smelter	675		184	15	a:pig28.da	KIDNEY	1840	
348	8-903637	6	HL Smelter	675		92.8	15	a:pig28.da	KIDNEY	928	
325	8-903622	7	LL Yard	75		22.6	15	a:pig28.da	KIDNEY	226	
329	8-903619	7	LL Yard	75		13.2	15	a:pig28.da	KIDNEY	132	
338	8-903662	7	LL Yard	75		27.6	15	a:pig28.da	KIDNEY	276	
343	8-903665	7	LL Yard	75		11.6	15	a:pig28.da	KIDNEY	116	
351	8-903644	7	LL Yard	75		28.6	15	a:pig28.da	KIDNEY	286	
302	8-903659	8	LL Yard	225		24.8	15	a:pig28.da	KIDNEY	248	
326	8-903649	8	LL Yard	225		34.4	15	a:pig28.da	KIDNEY	344	
328	8-903640	8	LL Yard	225		68.8	15	a:pig28.da	KIDNEY	688	
332	8-903664	8	LL Yard	225		30.2	15	a:pig28.da	KIDNEY	302	
346	8-903643	8	LL Yard	225		65.6	15	a:pig28.da	KIDNEY	656	
306	8-903642	9	LL Yard	675		65.6	15	a:pig28.da	KIDNEY	656	
333	8-903648	9	LL Yard	675		92	15	a:pig28.da	KIDNEY	920	

TABLE A-8 SUMMARY OF ENDPOINT OUTLIERS

Selected Outliers
Animal removed during course of study

test material	target dosage	Actual Dose*	group	pig#	Blood	Femur	Liver	Kidney
					MEASUREMENT ENDPOINT			
Control	0	0.00	1	304	7.5	1.35	10	10
Control	0	0.00	1	339	7.5	Missing	10	10
PbAc	75	75.06	2	309	32.4	5.1	114	98
PbAc	75	72.63	2	312	58.4	7.4	200	256
PbAc	75	75.99	2	324	48.3	6.45	214	274
PbAc	75	73.99	2	337	60.8	7.2	176	252
PbAc	75	82.01	2	340	62.5	6.4	164	164
PbAc	225	272.00	3	313	129.6	21.1	626	624
PbAc	225	237.95	3	315	104.2	15.35	736	480
PbAc	225	233.07	3	342	150.8	21.45	436	302
PbAc	225	258.78	3	354	94.3	13.55	414	380
PbAc	225	233.42	3	356	56.9	15.1	888 b	710
HL Smelter	75	81.05	4	305	32.1	3.85	74	76
HL Smelter	75	77.89	4	311	45.6	7.3	72	78
HL Smelter	75	74.23	4	318	46.5	3.95	98	124
HL Smelter	75	68.99	4	321	49.5	3.95	88	100
HL Smelter	75	81.68	4	331	33.8	6.7	106	134
HL Smelter	225	240.26	5	316	75.5	12.9	314	294
HL Smelter	225	210.01	5	317	78.7	13.15	240	288
HL Smelter	225	218.94	5	330	66.1	12.55	284	432
HL Smelter	225	232.96	5	352	89.3	13.25	622	446
HL Smelter	225	232.82	5	353	61.1	7.3	242	168
HL Smelter	675	768.28	6	319	151.6	26.2	774	614
HL Smelter	675	778.28	6	341	125.6	24.9	762	532
HL Smelter	675	685.96	6	344	143.6	26.8	2120	772
HL Smelter	675	716.77	6	345	165.6	41.25 b	2040	1840 b
HL Smelter	675	762.20	6	348	182.0	Missing	2130	928
LL Yard	75	67.39	7	325	62.3	6.15	242	226
LL Yard	75	72.28	7	329	51.1	5.15	96	132
LL Yard	75	80.52	7	338	64.1	7.4	314	276
LL Yard	75	78.76	7	343	39.2	4.7	116	116
LL Yard	75	75.99	7	351	44.1	6.6	240	286
LL Yard	225	222.86	8	302	52.1	9.15	382	248
LL Yard	225	215.94	8	326	81.9	12.85	390	344
LL Yard	225	198.72	8	328	154.9	17.1	592	688
LL Yard	225	258.51	8	332	120.1	Missing	440	302
LL Yard	225	260.69	8	346	73.3	13.2	2280 a1	656
LL Yard	675	665.91	9	306	136.2	19.65	890	656
LL Yard	675	691.38	9	333	139.0	Missing	2230	920
LL Yard	675	683.70	9	334	212.6	Missing	1670	1410
LL [illegible]	675	723.33	9	335	181.8	48.75	2570	2420 b
LL [illegible]	675	664.82	9	349	143.6	23.1	928	880
IV	100	94.54	10	307	220.7	57	1840	96 a2
IV	100	96.91	10	320	198.8	65	2040	2490
IV	100		10	322				
IV	100	108.55	10	347	179.8	59	2940	1690
IV	100	109.88	10	350	178.0	57	2230	1620

a *a priori* outlier determinations
- a1 This value was much higher than similarly dosed animals in the same group. Graphical inspection deemed it to be an outlier.
- a2 This value was much lower than similarly dosed animals in the same group. Graphical inspection deemed it to be an outlier.

b Outside 95% Prediction Intervals

pig number	sample	group	material administered	dosage	qualifier	lab result (ug/L)[b]	day	source file	MATRIX	Adjusted Value[a]	Notes
334	8-903631	9	LL Yard	675		141	15	a:pig28.da	KIDNEY	1410	
335	8-903628	9	LL Yard	675		242	15	a:pig28.da	KIDNEY	2420	
349	8-903630	9	LL Yard	675		88	15	a:pig28.da	KIDNEY	880	
301	8-903620	10	IV-100	100			15		KIDNEY		Culled
307	8-903641	10	IV-100	100		9.6	15	a:pig28.da	KIDNEY	96	
310	8-903633	10	IV-100	100		86.4	15	a:pig28.da	KIDNEY	864	
320	8-903645	10	IV-100	100		249	15	a:pig28.da	KIDNEY	2490	
322	8-903626	10	IV-100	100			15		KIDNEY		Died
347	8-903655	10	IV-100	100		169	15	a:pig28.da	KIDNEY	1690	
350	8-903623	10	IV-100	100		162	15	a:pig28.da	KIDNEY	1620	
355	8-903667	10	IV-100	100		2.4	15	a:pig28.da	KIDNEY	24	
304	8-903574	1	control	0	<	2	15	a:pig25.da	LIVER	10	
339	8-903595	1	control	0	<	2	15	a:pig25.da	LIVER	10	
309	8-903571	2	PbAc	75		11.4	15	a:pig25.da	LIVER	114	
312	8-903582	2	PbAc	75		20	15	a:pig25.da	LIVER	200	
324	8-903615	2	PbAc	75		21.4	15	a:pig25.da	LIVER	214	
337	8-903605	2	PbAc	75		17.6	15	a:pig25.da	LIVER	176	
340	8-903589	2	PbAc	75		16.4	15	a:pig25.da	LIVER	164	
313	8-903601	3	PbAc	225		62.6	15	a:pig25.da	LIVER	626	
315	8-903604	3	PbAc	225		73.6	15	a:pig25.da	LIVER	736	
342	8-903596	3	PbAc	225		43.6	15	a:pig25.da	LIVER	436	
354	8-903594	3	PbAc	225		41.4	15	a:pig25.da	LIVER	414	
356	8-903581	3	PbAc	225		88.8	15	a:pig25.da	LIVER	888	
305	8-903584	4	HL Smelter	75		7.4	15	a:pig25.da	LIVER	74	
311	8-903586	4	HL Smelter	75		7.2	15	a:pig25.da	LIVER	72	
318	8-903577	4	HL Smelter	75		9.8	15	a:pig25.da	LIVER	98	
321	8-903578	4	HL Smelter	75		8.8	15	a:pig25.da	LIVER	88	
331	8-903608	4	HL Smelter	75		10.6	15	a:pig25.da	LIVER	106	
316	8-903569	5	HL Smelter	225		31.4	15	a:pig25.da	LIVER	314	
317	8-903570	5	HL Smelter	225		24	15	a:pig25.da	LIVER	240	
330	8-903576	5	HL Smelter	225		28.4	15	a:pig25.da	LIVER	284	
352	8-903602	5	HL Smelter	225		62.2	15	a:pig25.da	LIVER	622	
353	8-903612	5	HL Smelter	225		24.2	15	a:pig25.da	LIVER	242	
319	8-903587	6	HL Smelter	675		77.4	15	a:pig25.da	LIVER	774	
341	8-903580	6	HL Smelter	675		76.2	15	a:pig25.da	LIVER	762	
344	8-903597	6	HL Smelter	675		212	15	a:pig25.da	LIVER	2120	
345	8-903611	6	HL Smelter	675		204	15	a:pig25.da	LIVER	2040	
348	8-903592	6	HL Smelter	675		213	15	a:pig25.da	LIVER	2130	
325	8-903613	7	LL Yard	75		24.2	15	a:pig25.da	LIVER	242	
329	8-903575	7	LL Yard	75		9.6	15	a:pig25.da	LIVER	96	
338	8-903588	7	LL Yard	75		31.4	15	a:pig25.da	LIVER	314	
343	8-903616	7	LL Yard	75		11.6	15	a:pig25.da	LIVER	116	
351	8-903609	7	LL Yard	75		24	15	a:pig25.da	LIVER	240	
302	8-903585	8	LL Yard	225		38.2	15	a:pig25.da	LIVER	382	
326	8-903617	8	LL Yard	225		39	15	a:pig25.da	LIVER	390	
328	8-903573	8	LL Yard	225		59.2	15	a:pig25.da	LIVER	592	
332	8-903599	8	LL Yard	225		44	15	a:pig25.da	LIVER	440	
346	8-903590	8	LL Yard	225		228	15	a:pig25.da	LIVER	2280	
306	8-903600	9	LL Yard	675		89	15	a:pig25.da	LIVER	890	
333	8-903607	9	LL Yard	675		223	15	a:pig25.da	LIVER	2230	
334	8-903598	9	LL Yard	675		167	15	a:pig25.da	LIVER	1670	
335	8-903579	9	LL Yard	675		257	15	a:pig25.da	LIVER	2570	
349	8-903593	9	LL Yard	675		92.8	15	a:pig25.da	LIVER	928	
301	8-903591	10	IV-100	100			15		LIVER		Culled
307	8-903614	10	IV-100	100		184	15	a:pig25.da	LIVER	1840	
310	8-903618	10	IV-100	100		203	15	a:pig25.da	LIVER	2030	
320	8-903606	10	IV-100	100		204	15	a:pig25.da	LIVER	2040	
322	8-903583	10	IV-100	100			15		LIVER		Died
347	8-903603	10	IV-100	100		294	15	a:pig25.da	LIVER	2940	
350	8-903572	10	IV-100	100		223	15	a:pig25.da	LIVER	2230	
355	8-903610	10	IV-100	100		6	15	a:pig25.da	LIVER	60	

a Non-detects evaluated using 1/2 the quantitation limit. Laboratory results (ug/L) converted to tissue concentrations by dividing by sample dilution factors of 0.1 kg/L (liver, kidney) or 2 g/L (ashed bone). Final units are ug Pb/kg wet weight (liver, kidney) or ug Pb/g ashed bone (femur)

b Blanks represent animals that died or were culled from the study and/or bone samples which encountered labelling problems during the drying procedure.

TABLE A-9 Best Curve Fit Parameters

		BONE				KIDNEY	
PbAc Curve -	**Exp**	**PbAc Curve -**	**Linear**	**PbAc Curve -**	**Linear**	**PbAc Curve -**	**Linear**
a	8.57	a	2.14	a	3.69	a	51.8
b		b	0.061	b	2.19	b	1.83
c	166.3	c		c		c	
d	0.0045	d		d		d	
R2	0.778	R2	0.905	R2	0.878	R2	0.784

HL Smelter Curve -	Exp	HL Smelter Curve -	Linear	HL Smelter Curve -	Linear	HL Smelter Curve -	Linear
a	8.57	a	2.14	a	3.69	a	51.8
b		b	0.0334	b	2.011	b	0.906
c	166.3	c		c		c	
d	0.0025	d		d		d	
R2	0.943	R2	0.932	R2	0.715	R2	0.846

LL Yard Curve -	Exp	LL Yard Curve -	Linear	LL Yard Curve -	Linear	LL Yard Curve -	Linear
a	8.57	a	2.14	a	3.69	a	51.8
b		b	0.043	b	2.403	b	1.407
c	166.3	c		c		c	
d	0.0035	d		d		d	
R2	0.811	R2	0.77	R2	0.788	R2	0.786

Equations Used

EXP Y=a+c*(1-exp(-d*dose))

LIN Y=a+b*dose

TABLE A-10 Relative Bioavailability of Lead in Test Materials

Endpoint	Test Material	
	HL Smelter	LL Yard
Blood	0.56	0.78
Liver	0.92	1.10
Kidney	0.50	1.10
Bone	0.55	0.70

Definitions

Plausible Range:	RBA(Blood) to mean RBA for Tissues
Preferred Range:	RBA(Blood) to (RBA(Blood) + RBA(Tissues))/2
Suggested Point Est:	1/2(RBA(Blood) + (RBA(Blood)+RBA(Tissues))/2)

Relative Bioavailability

	HL Smelter		LL Yard	
Plausible Range	0.56	0.65	0.78	0.97
Preferred Range	0.56	0.60	0.78	0.87
Point Estimate	0.58		0.82	

Absolute Bioavailability

	HL Smelter		LL Yard	
Plausible Range	28%	33%	39%	48%
Preferred Range	28%	30%	39%	44%
Point Estimate	29%		41%	

TABLE A-11 INTRALABORATORY DUPLICATES

RPD = Relative Percent Difference
RPD = 100*[Orig-Dup]/((Orig+Dup)/2

* Non detects evaluated at 1/2 DL

Pig number	group	material administered	dosage	day	matrix	Duplicate Value*	Original Value*	Average	RPD	Avg RPD
301	10	IV-100	100	0	BLOOD	0.5	0.5	0.5	0%	
306	9	LL Yard	675	2	BLOOD	4	4	4	0%	
307	10	IV-100	100	7	BLOOD	16.5	16.4	16.45	-1%	
311	4	HL Smelter	75	3	BLOOD	1.5	1.5	1.5	0%	
317	10	IV-100	100	0	BLOOD	0.5		0.5	-200%	
321	4	HL Smelter	75	1	BLOOD	0.5	0.5	0.5	0%	
325	7	LL Yard	75	-4	BLOOD	0.5	0.5	0.5	0%	
326	8	LL Yard	225	2	BLOOD	1.4	1.6	1.5	13%	
331	4	HL Smelter	75	12	BLOOD	4.1	3.7	3.9	-10%	
332	8	LL Yard	225	5	BLOOD	8.6	7.5	8.05	-14%	
335	9	LL Yard	675	15	BLOOD	17.7	16.5	17.1	-7%	
337	2	PbAc	75	9	BLOOD	4.9	4.5	4.7	-9%	
338	7	LL Yard	75	5	BLOOD	2.3	2	2.15	-14%	
339	1	control	0	1	BLOOD	0.5	0.5	0.5	0%	
340	2	PbAc	75	12	BLOOD	6	5.2	5.6	-14%	
341	6	HL Smelter	675	9	BLOOD	9.9	9.9	9.9	0%	
343	7	LL Yard	75	15	BLOOD	4.8	5.2	5	8%	
345	6	HL Smelter	675	-4	BLOOD	0.5	0.5	0.5	0%	
353	5	HL Smelter	225	3	BLOOD	3.9	4.1	4	5%	
354	3	PbAc	225	7	BLOOD	7.2	7.1	7.15	-1%	

TABLE A-12 CDC STANDARDS

			Measured*			Nominal		
Sample ID	Day	Q	Low Std	Med Std	High Std	Low Std	Med Std	High Std
3.1	0		1			1.7	4.8	14.9
3.1	1	<	1			1.7	4.8	14.9
3.1	2	<	1			1.7	4.8	14.9
3.1	5		1			1.7	4.8	14.9
3.1	7	<	1			1.7	4.8	14.9
3.1	9	<	1			1.7	4.8	14.9
3.2	-4			4.4		1.7	4.8	14.9
3.2	0			3.9		1.7	4.8	14.9
3.2	2			4.1		1.7	4.8	14.9
3.2	3			4.4		1.7	4.8	14.9
3.2	5			4.4		1.7	4.8	14.9
3.2	7			4.6		1.7	4.8	14.9
3.3	1				14.5	1.7	4.8	14.9
3.3	9				13.5	1.7	4.8	14.9
3.3	12				15.1	1.7	4.8	14.9
3.3	15				15.4	1.7	4.8	14.9
3.3	-4				14.4	1.7	4.8	14.9
3.3	3				14.2	1.7	4.8	14.9
3.3	12				14.2	1.7	4.8	14.9
3.3	15				14.9	1.7	4.8	14.9

* Non-detects evaluated at the detection limit

TABLE A-13 INTERLABORATORY COMPARISON

Tag Number	Pig Number	Group	Material Administered	Dosage	Qualifier CDC	Qualifier ESD		Result CDC	Result ESD	Result Average	RPD
8-903059	331	4	Soil-1	75	U	<		0.6	1	0.8	50
8-903076	342	3	PbAc	225				8	6.8	7.4	-16
8-903159	311	4	Soil-1	75	U	<		0.6	1	0.8	50
8-903160	344	6	Soil-1	675				3.1	3.2	3.15	3
8-903178	339	1	control	0	U	<		0.6	1	0.8	50
8-903202	356	3	PbAc	225		<		0.9	1	0.95	11
8-903261	343	7	Soil-2	75		<		1.5	1	1.25	-40
8-903263	324	2	PbAc	75				1.2	1.2	1.2	0
8-903265	343	7	Soil-2	75				2.5	1.9	2.2	-27
8-903302	342	3	PbAc	225				10.1	8.1	9.1	-22
8-903345	354	3	PbAc	225				8.3	7.1	7.7	-16
8-903351	316	5	Soil-1	225				6.8	5.7	6.25	-18
8-903367	343	7	Soil-2	75				4	2.8	3.4	-35
8-903370	348	6	Soil-1	675				16.3	14.8	15.55	-10
8-903436	342	3	PbAc	225				13.5	12.8	13.15	-5
8-903463	319	6	Soil-1	675				14.3	13.2	13.75	-8
8-903498	307	10	IV-100	100				18	17.3	17.65	-4
8-903502	313	3	PbAc	225				12.2	11.4	11.8	-7

FIGURE A-1 PbAc and IV Groups by Day
Raw Data - Phase II Experiment 3

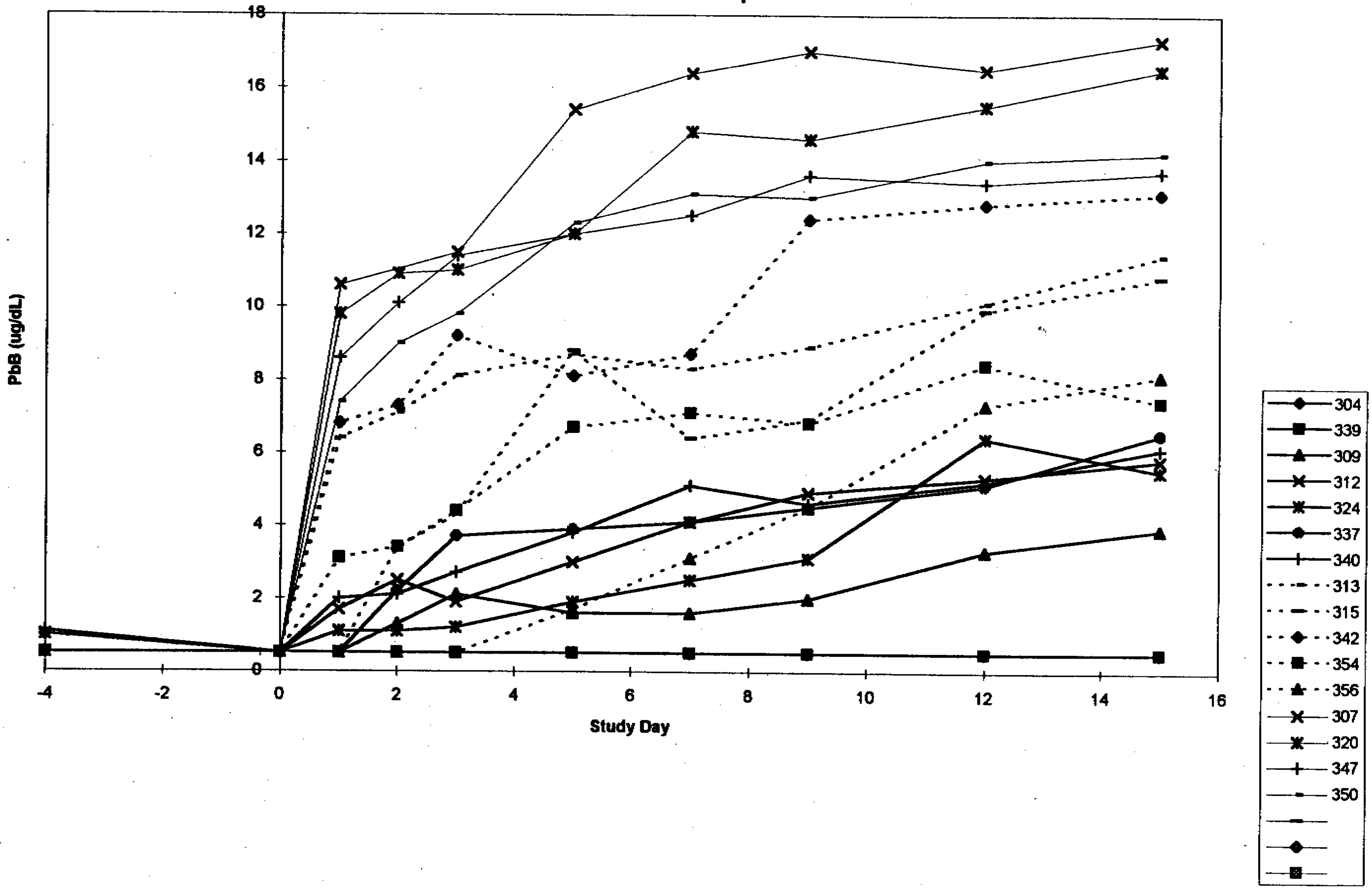

FIGURE A-2 HL Smelter Groups by Day
Raw Data - Phase II Experiment 3

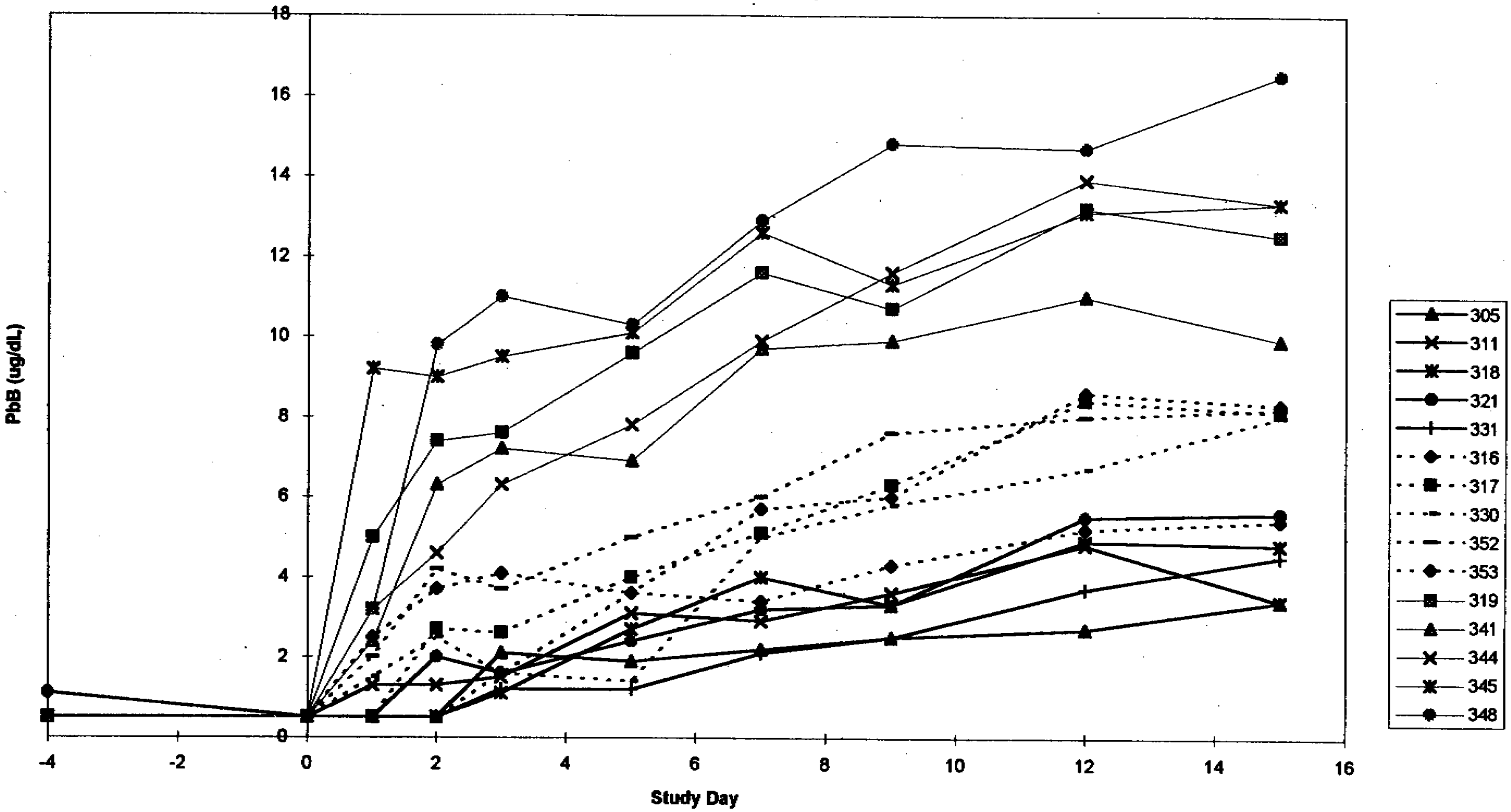

FIGURE A-3 LL Yard Groups
Raw Data - Phase II Experiment 3

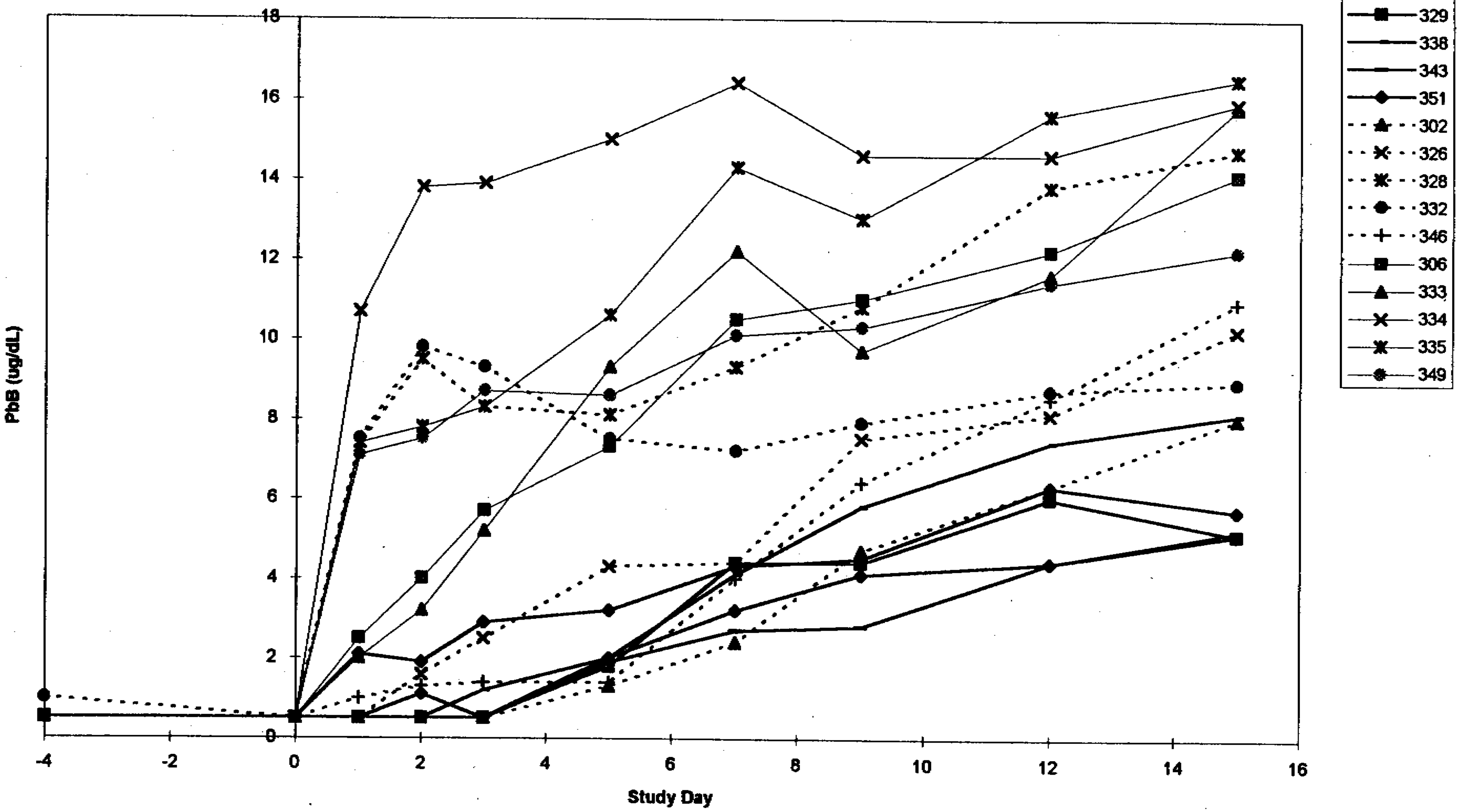

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FIGURE A-4 Group Mean PbB By Day
Raw Data

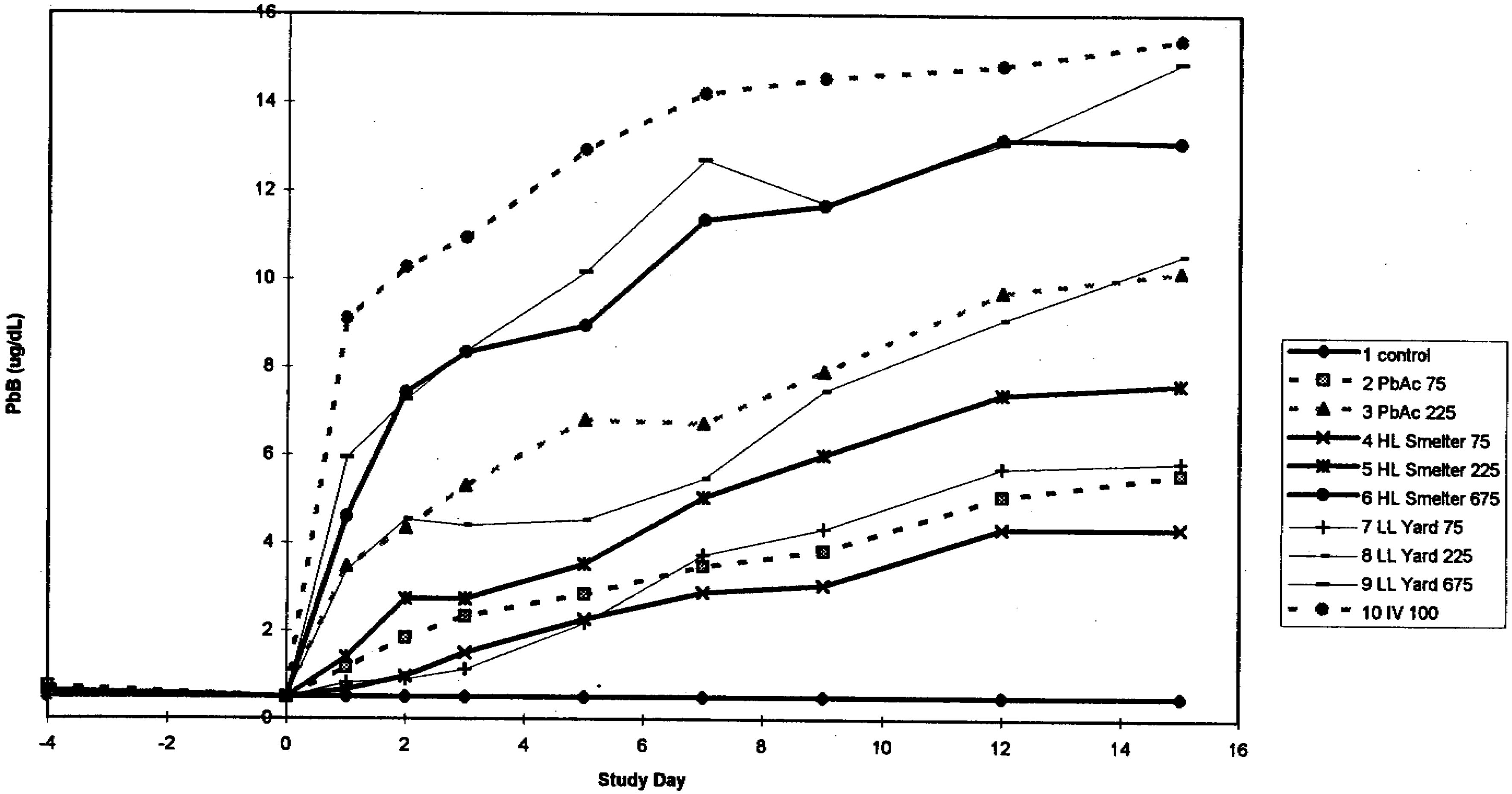
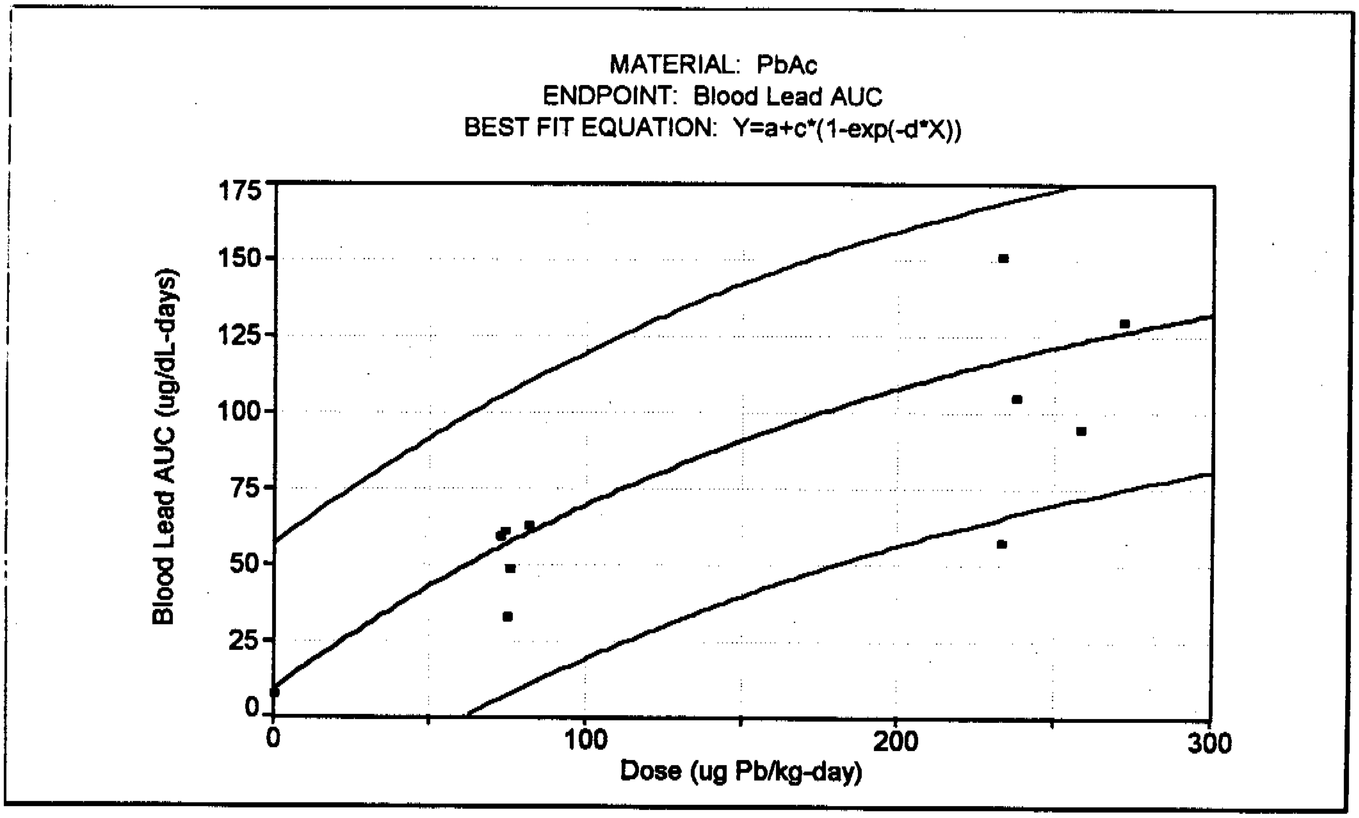


FIGURE A-5 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

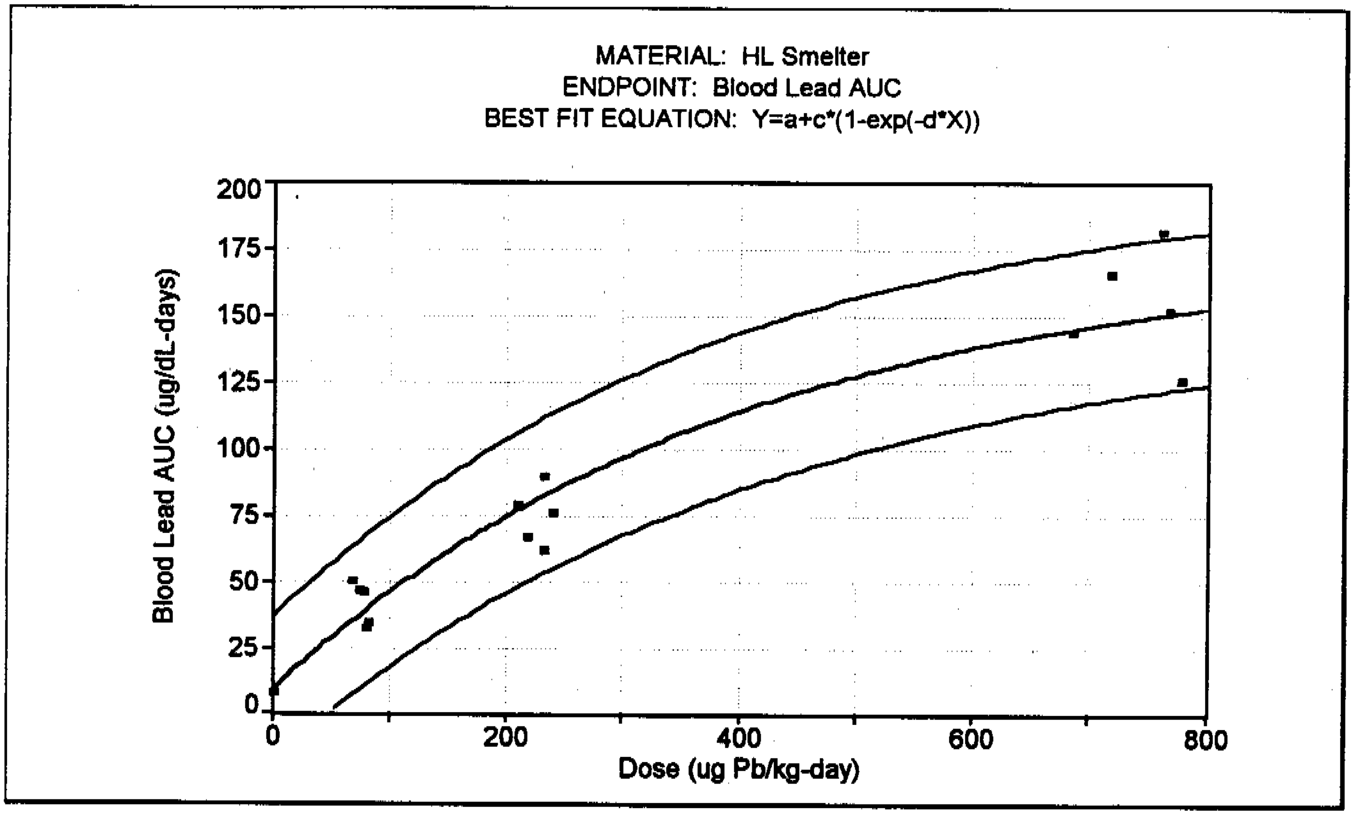


Parameters	Value	Std. Error	95% Confidence Limits	
a	8.57	fixed value	–	–
c	166.3	fixed value	–	–
d	0.0045	0.0007	0.003	0.006

Adj R^2	0.768

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-6 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

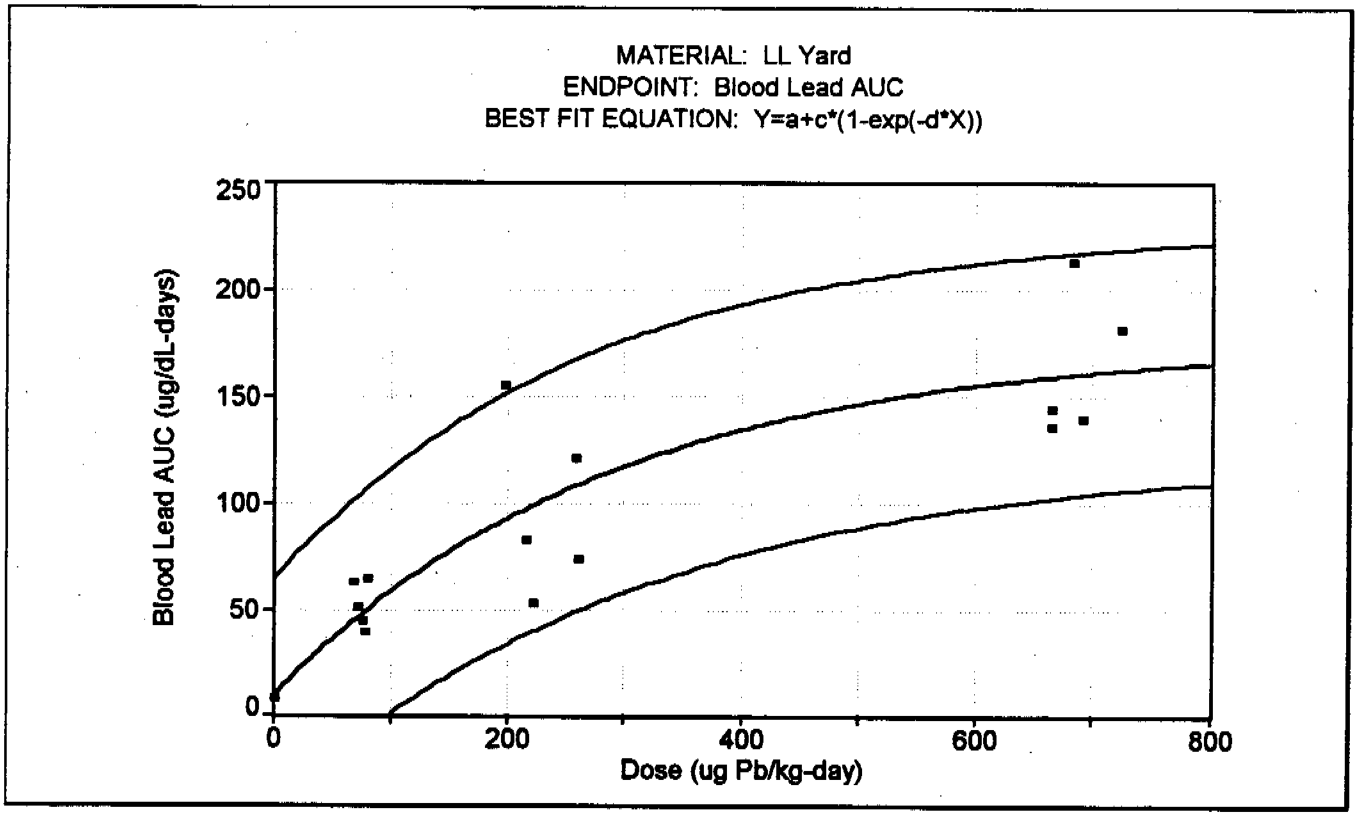


Parameters	Value	Std. Error	95% Confidence Limits	
a	8.57	fixed value	--	--
c	166.3	fixed value	--	--
d	0.0025	0.0002	0.002	0.003

Adj R^2	0.945

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-7 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

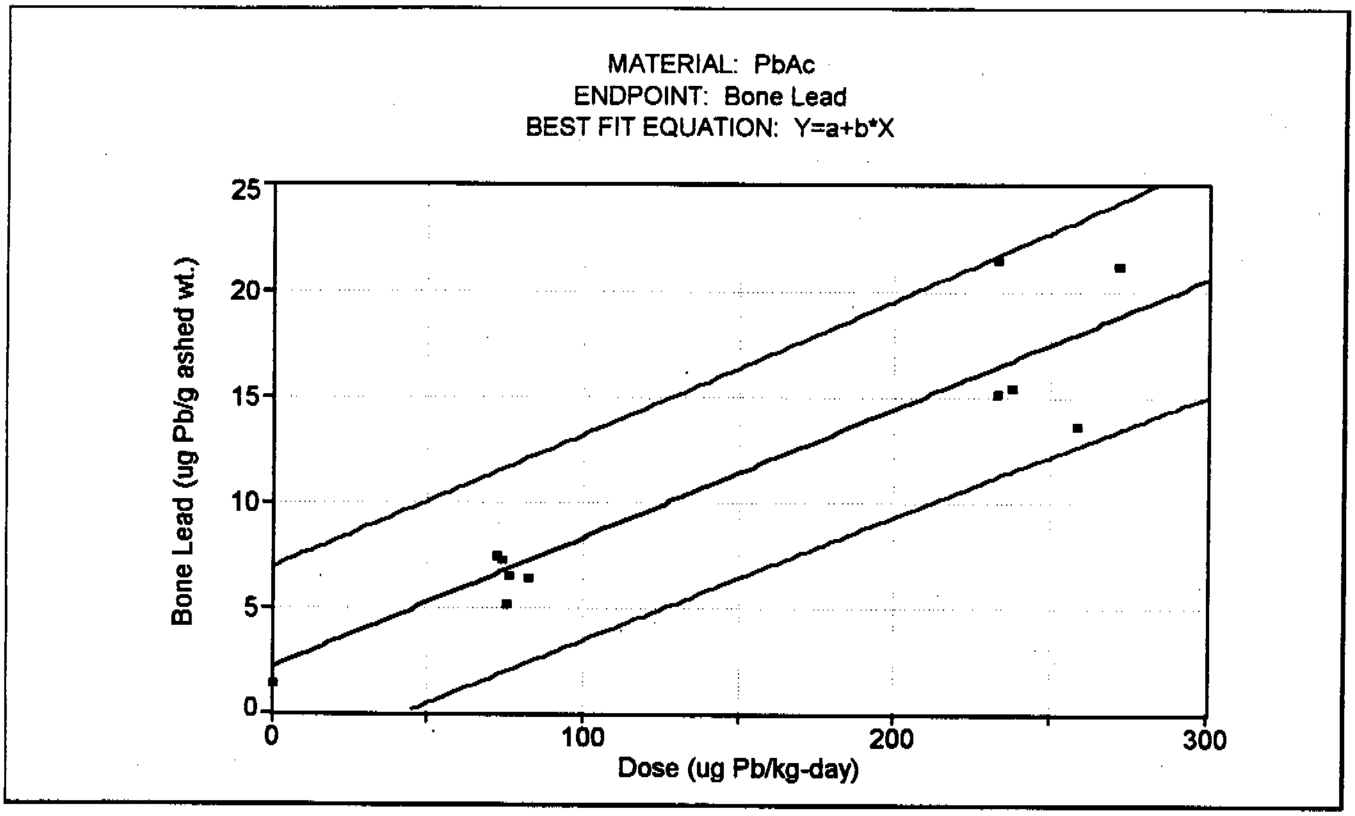


Parameters	Value	Std. Error	95% Confidence Limits	
a	8.57	fixed value	--	--
c	166.3	fixed value	--	--
d	0.0035	0.0006	0.0023	0.0047

Adj R^2	0.823

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-8 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

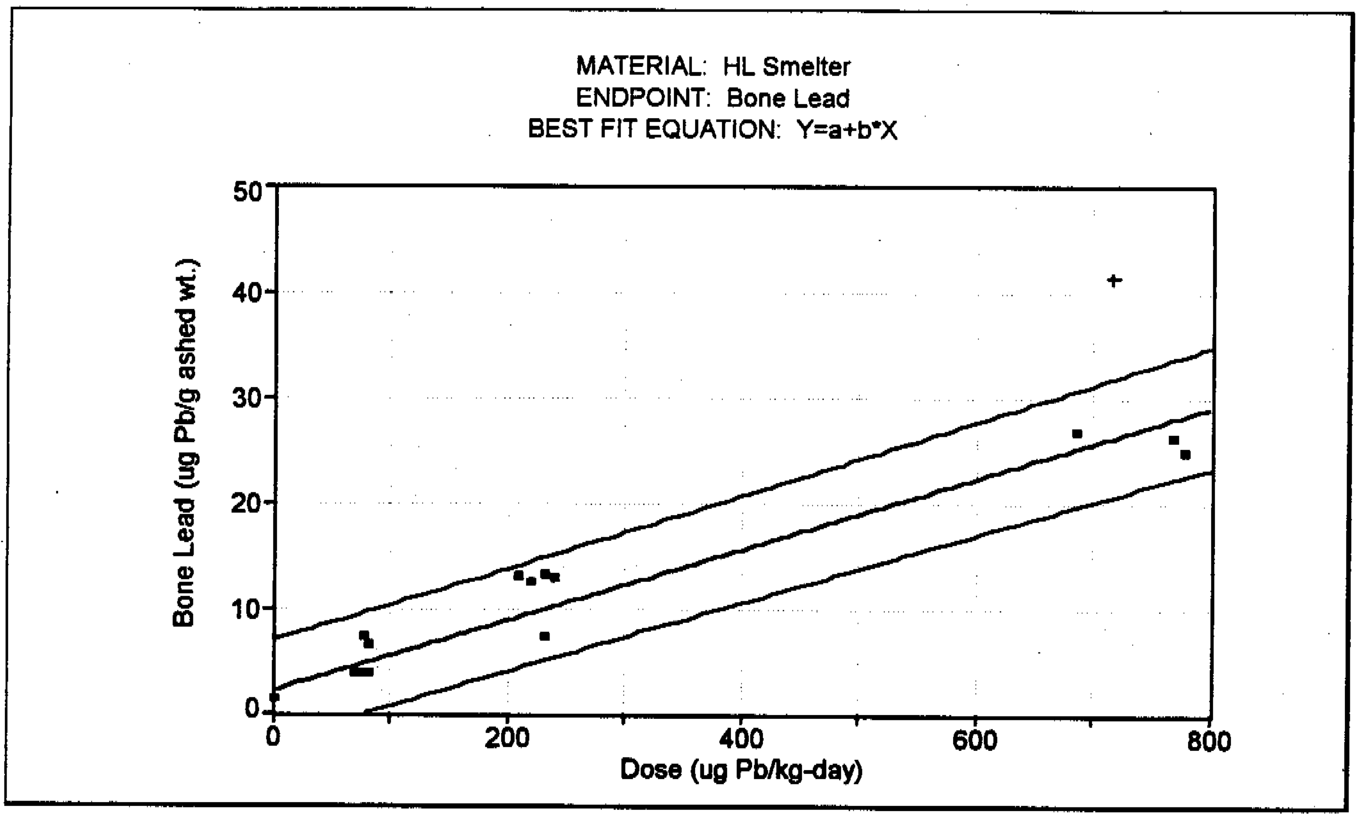


Parameters	Value	Std. Error	95% Confidence Limits	
a	2.14	fixed value	--	--
b	0.0609	0.0043	0.051	0.071

Adj R^2	0.905

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-9 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

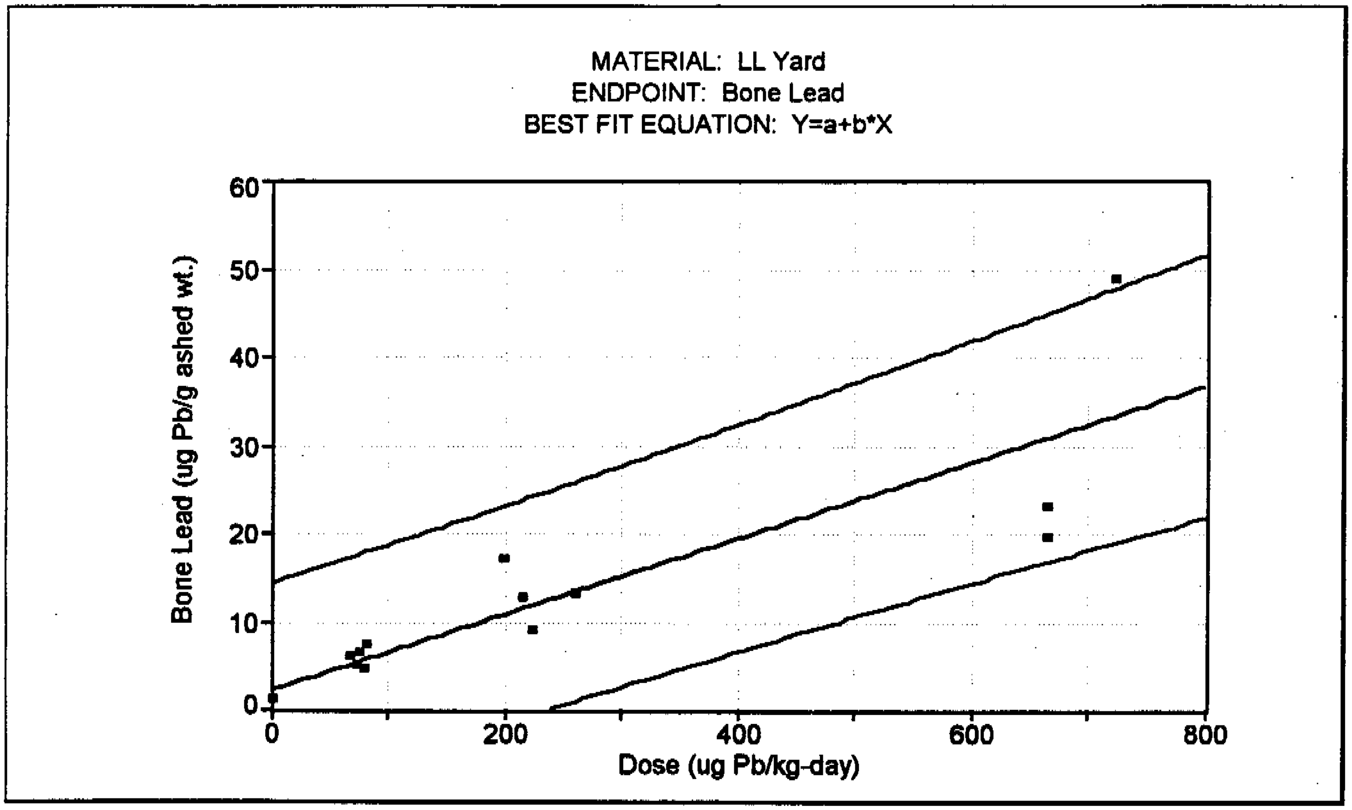


Parameters	Value	Std. Error	95% Confidence Limits	
a	2.14	fixed value	—	—
b	0.0334	0.0018	0.0295	0.0373

Adj R^2	0.932

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-10 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

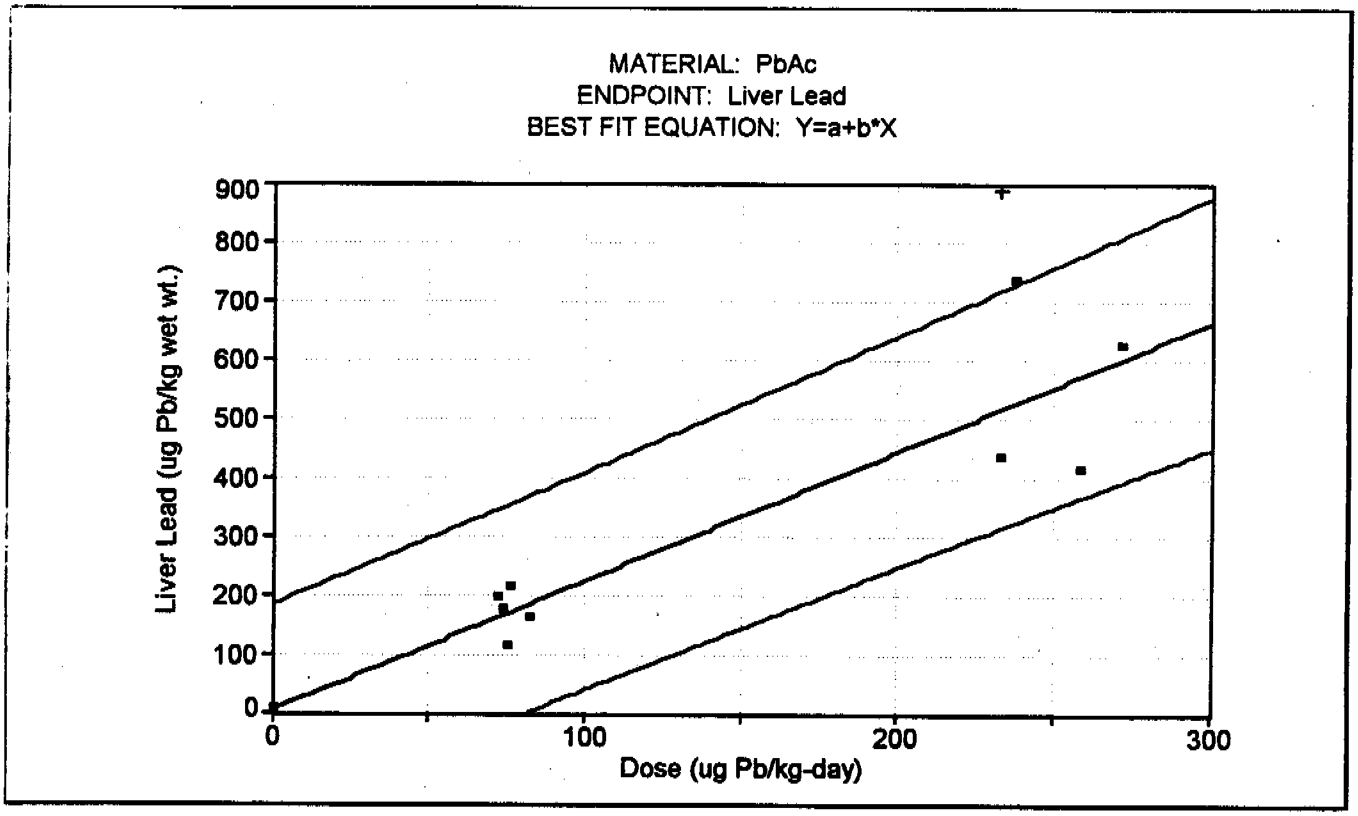


Parameters	Value	Std. Error	95% Confidence Limits	
a	2.14	fixed value	--	--
b	0.043	0.005	0.032	0.054

Adj R^2	0.77

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-11 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

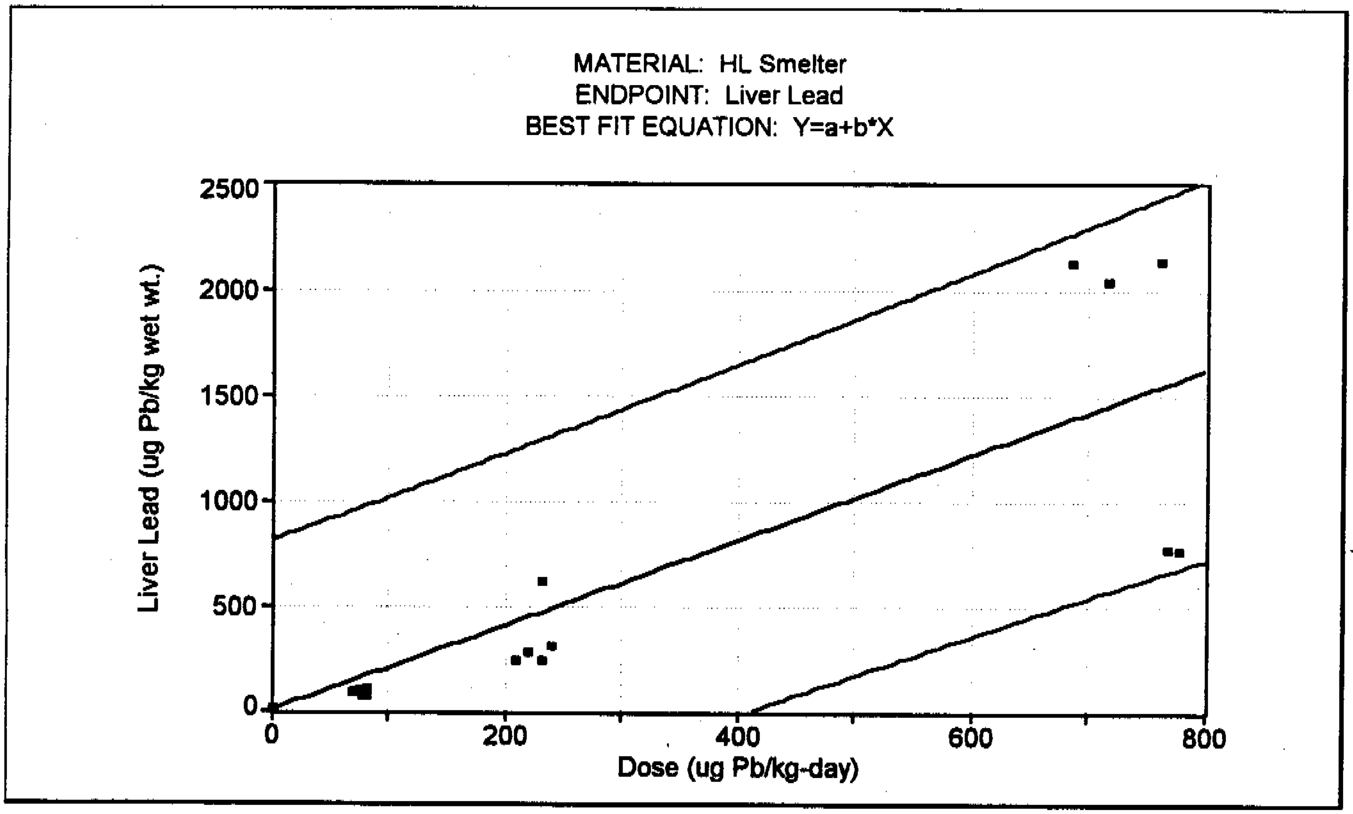


Parameters	Value	Std. Error	95% Confidence Limits	
a	3.69	fixed value	–	–
b	2.19	0.172	1.806	2.57

Adj R^2	0.878

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-12 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

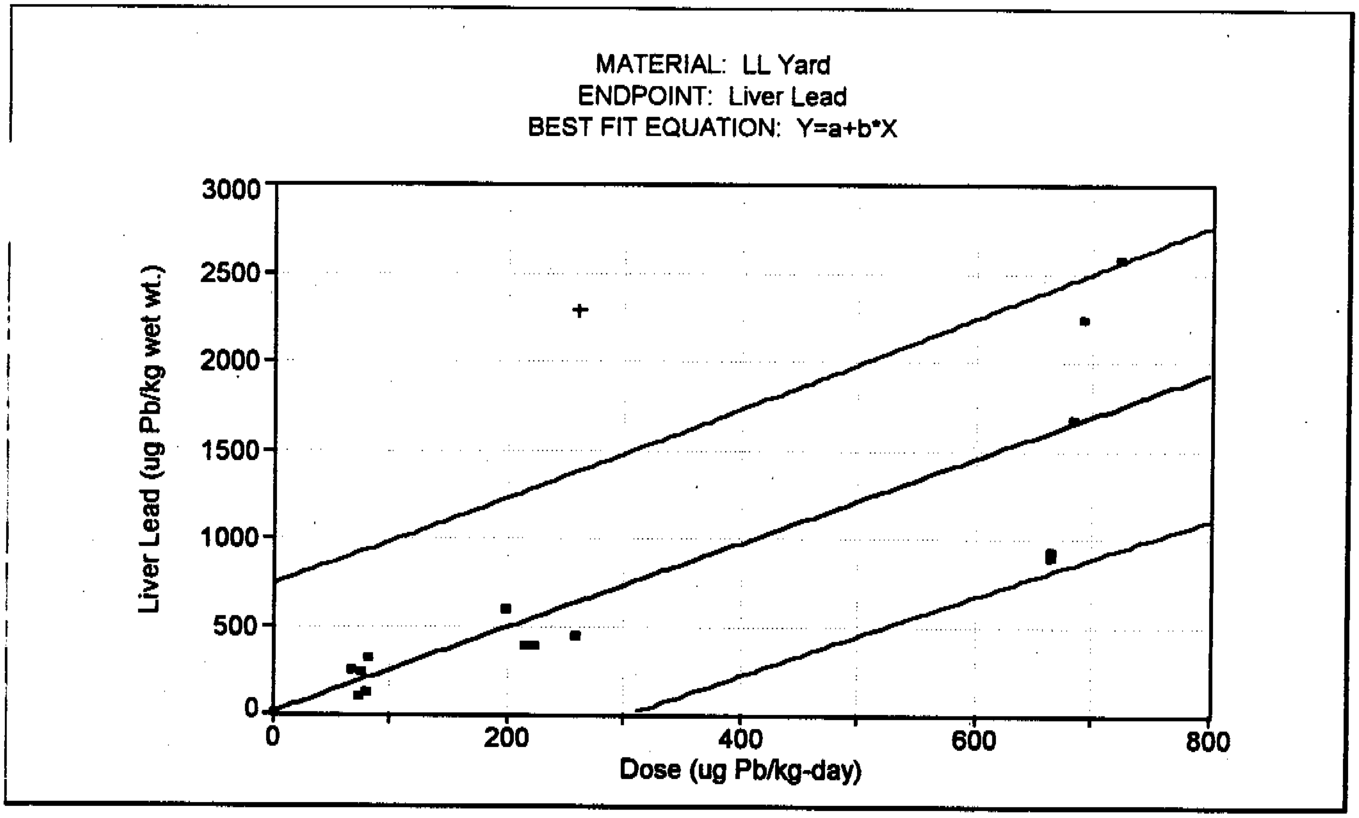


Parameters	Value	Std. Error	95% Confidence Limits	
a	3.69	fixed value	--	--
b	2.011	0.235	1.51	2.51

Adj R^2	0.715

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-13 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

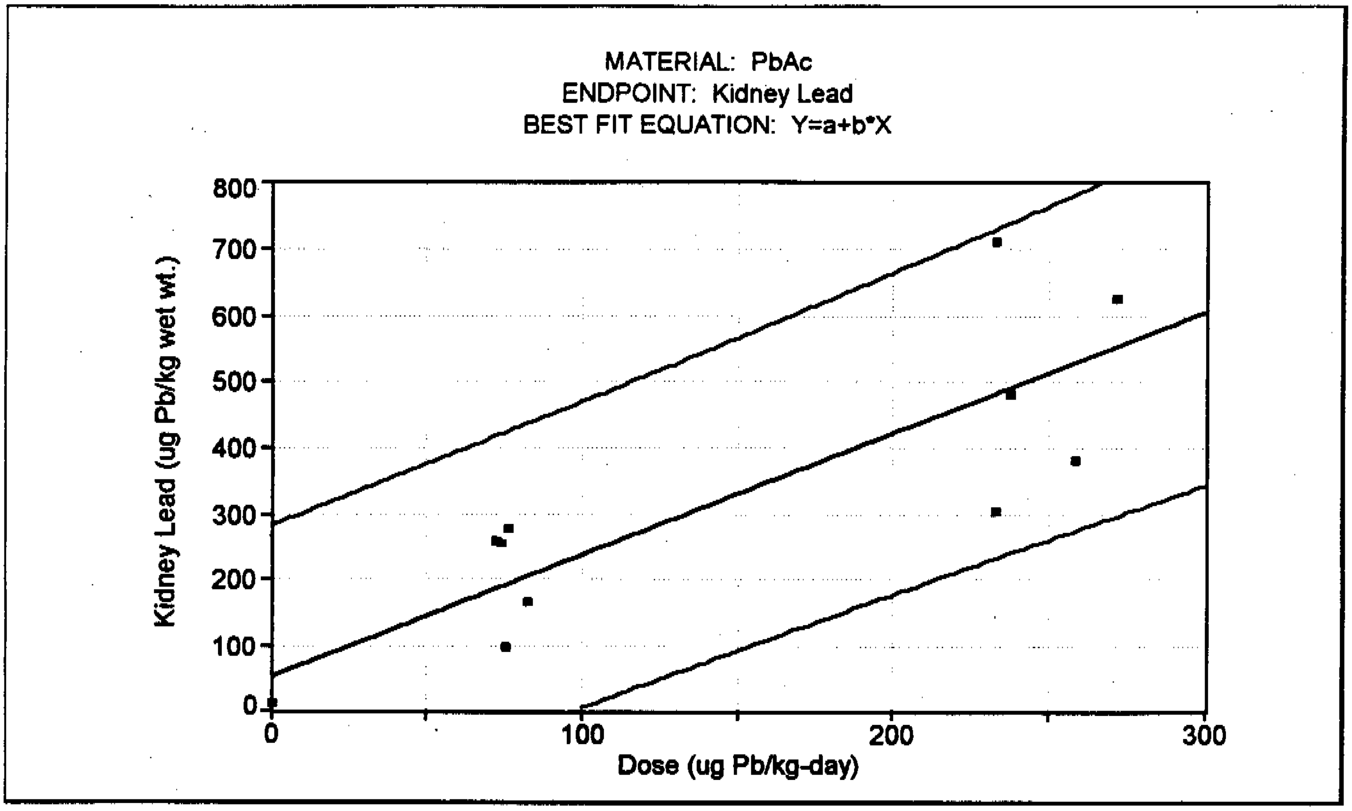


Parameters	Value	Std. Error	95% Confidence Limits	
a	3.69	fixed value	--	--
b	2.403	0.232	1.909	2.897

Adj R^2	0.788

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-14 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

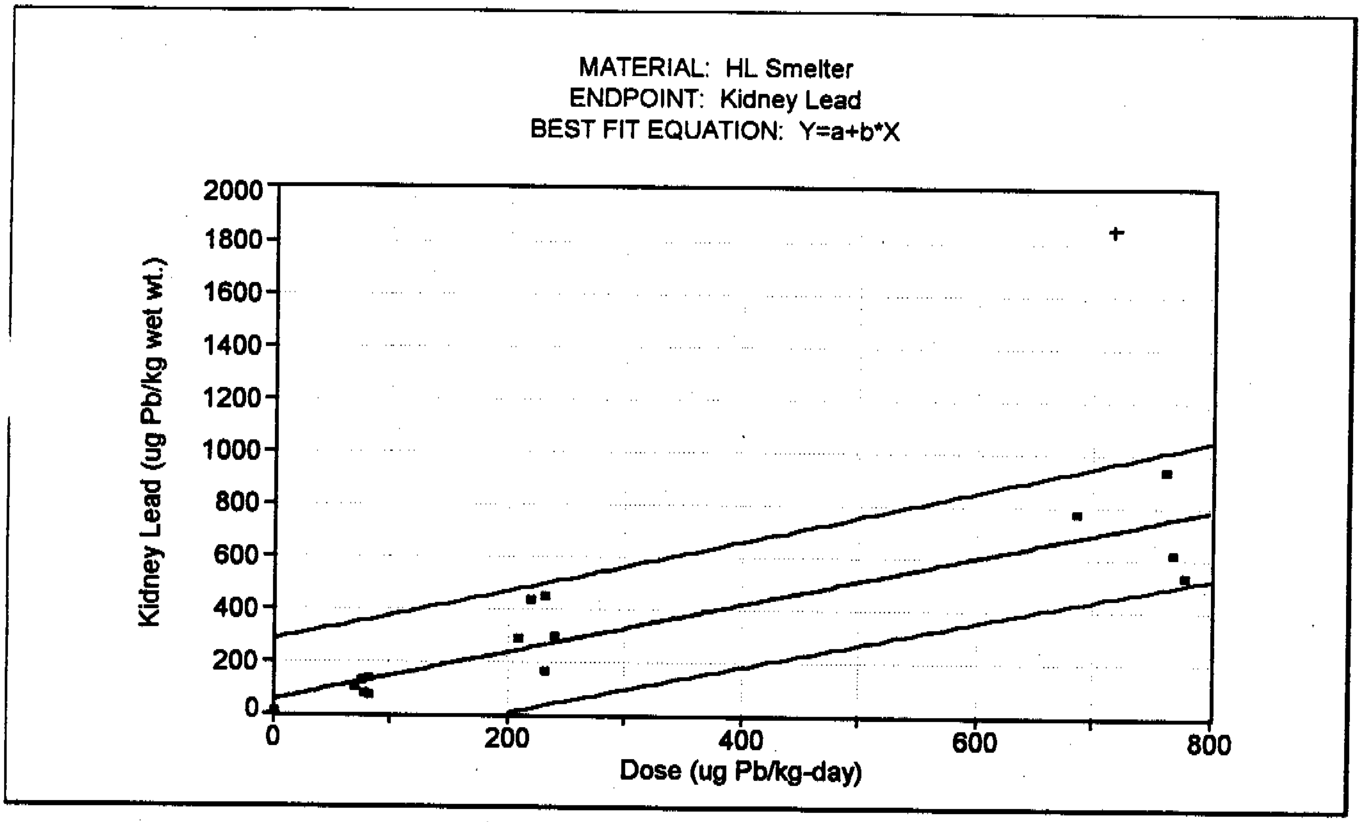


Parameters	Value	Std. Error	95% Confidence Limits	
a	51.8	fixed value	--	--
b	1.83	0.199	1.392	2.269

Adj R^2	0.784

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-15 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

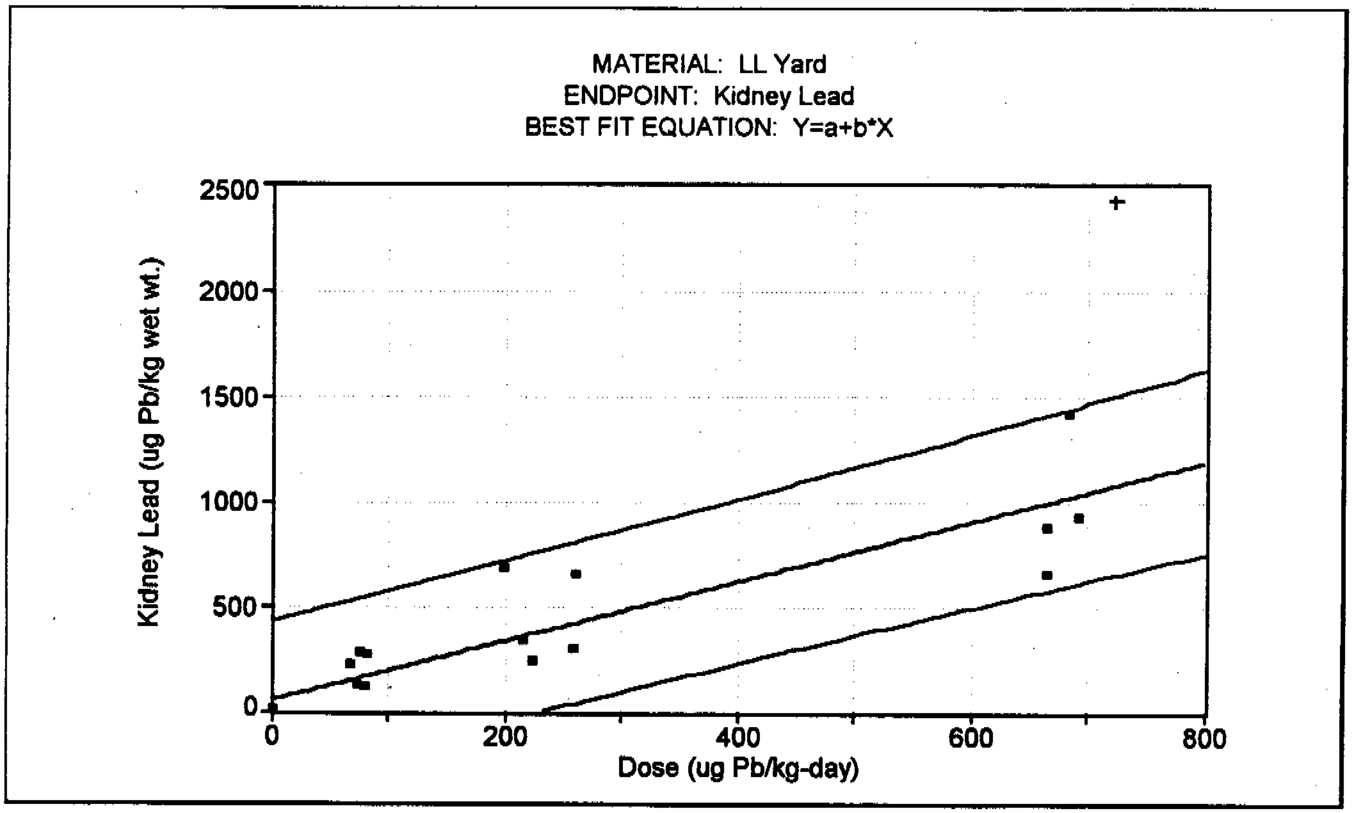


Parameters	Value	Std. Error	95% Confidence Limits	
a	51.8	fixed value	–	–
b	0.906	0.073	0.75	1.06

Adj R^2	0.846

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-16 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*



Parameters	Value	Std. Error	95% Confidence Limits	
a	51.8	fixed value	–	–
b	1.407	0.131	1.129	1.685

Adj R^2	0.786

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

TABLES AND GRAPHS FROM EXPERIMENT 4

TABLE A-1 BODY WEIGHTS AND ADMINISTERED DOSES, BY DAY*

Body weights were measured on days -1, 2, 5, 8, 11, 14. Weights for other days are estimated, based on linear interpolation between measured values.

Group	ID #	Day -1 BW (kg)	Day -1 ug Pb per day	Day 0 BW (kg)	Day 0 ug Pb per day	Day 1 BW (kg)	Day 1 ug Pb per day	Day 2 BW (kg)	Day 2 ug Pb per day	Day 3 BW (kg)	Day 3 ug Pb per day	Day 4 BW (kg)	Day 4 ug Pb per day	Day 5 BW (kg)	Day 5 ug Pb per day	Day 6 BW (kg)	Day 6 ug Pb per day	Day 7 BW (kg)	Day 7 ug Pb per day	Day 8 BW (kg)	Day 8 ug Pb per day	Day 9 BW (kg)	Day 9 ug Pb per day	Day 10 BW (kg)	Day 10 ug Pb per day	Day 11 BW (kg)	Day 11 ug Pb per day	Day 12 BW (kg)	Day 12 ug Pb per day	Day 13 BW (kg)	Day 13 ug Pb per day	Day 14 BW (kg)	Day 14 ug Pb per day	Day 15 BW (kg)	Day 15 ug Pb per day
1	417	12.1	0	12.5	0	12.8	0	13.2	0	13.7	0	14.1	0	14.6	0	15.1	0	15.5	0	16	0	16.6	0	17.3	0	17.9	0	18.4	0	18.9	0	19.4	0	19.9	0
1	430	8.7	0	8.9	0	9.2	0	9.4	0	9.8	0	10.2	0	10.6	0	11.1	0	11.6	0	12.1	0	12.7	0	13.3	0	13.9	0	14.6	0	15.3	0	16	0	16.7	0
2	409	10.7	0	11.1	827	11.4	827	11.8	827	12.3	894	12.9	894	13.4	894	13.9	992	14.4	992	14.9	992	15.4	1088	16.0	1088	16.5	1088	17.1	1205	17.7	1205	18.3	1205	18.9	0
2	419	11.9	0	12.1	827	12.2	827	12.4	827	12.7	894	13.1	894	13.4	894	13.8	992	14.1	992	14.5	992	15.0	1088	15.6	1088	16.1	1088	16.2	1205	16.4	1205	16.5	1205	16.6	0
2	429	10	0	10.3	827	10.5	827	10.8	827	11.3	894	11.7	894	12.2	894	12.7	992	13.3	992	13.8	992	14.3	1088	14.9	1088	15.4	1088	16.0	1205	16.7	1205	17.3	1205	17.9	0
2	443	8.7	0	9.1	827	9.5	827	9.9	827	10.2	894	10.6	894	10.9	894	11.3	992	11.6	992	12	992	12.4	1088	12.8	1088	13.2	1088	13.8	1205	14.3	1205	14.9	1205	15.5	0
2	444	8.8	0	9.1	827	9.4	827	9.7	827	10.2	894	10.7	894	11.2	894	11.6	992	11.9	992	12.3	992	12.9	1088	13.5	1088	14.1	1088	14.7	1205	15.4	1205	16	1205	16.6	0
3	408	9.9	0	10.3	2480	10.8	2480	11.3	2480	11.7	2682	12.0	2682	12.4	2682	12.8	2975	13.4	2975	13.9	2975	14.4	3283	14.8	3283	15.3	3283	16.0	3614	16.7	3614	17.4	3614	18.1	0
3	410	10.8	0	11.0	2480	11.1	2480	11.3	2480	11.7	2682	12.0	2682	12.4	2682	12.8	2975	13.1	2975	13.5	2975	14.0	3283	14.5	3283	15	3283	15.4	3614	15.8	3614	16.2	3614	16.6	0
3	426	10.8	0	11.1	2480	11.4	2480	11.7	2480	12.2	2682	12.7	2682	13.2	2682	13.7	2975	14.2	2975	14.7	2975	15.2	3283	15.7	3283	16.2	3283	16.9	3614	17.6	3614	18.3	3614	19.0	0
3	449	10.9	0	11.2	2480	11.4	2480	11.7	2480	12.1	2682	12.4	2682	12.8	2682	13.2	2975	13.6	2975	14	2975	14.6	3283	15.1	3283	15.7	3283	16.0	3614	16.2	3614	16.5	3614	16.8	0
3	455	11.1	0	11.5	2480	12.0	2480	12.4	2480	12.8	2682	13.3	2682	13.7	2682	14.2	2975	14.8	2975	15.3	2975	15.8	3283	16.4	3283	17	3283	17.6	3614	18.2	3614	18.8	3614	19.4	0
4	402	11.2	0	11.5	837	11.8	837	12.1	837	12.7	900	13.2	900	13.8	900	14.2	1002	14.7	1002	15.1	1002	15.7	1085	16.2	1085	16.8	1085	17.6	1217	18.3	1217	19.1	1217	19.9	0
7	404	10.3	0	10.7	915	11.2	915	11.6	915	12.0	878	12.3	878	12.7	878	12.9	907	13.2	907	13.4	907	14.1	1083	14.7	1083	15.4	1083	15.9	1214	16.4	1214	16.9	1214	17.4	0
7	406	10	0	10.2	915	10.3	915	10.5	915	11.1	878	11.8	878	12.4	878	12.7	907	13.0	907	13.3	907	13.7	1083	14.2	1083	14.6	1083	15.2	1214	15.7	1214	16.3	1214	16.9	0
7	416	7.5	0	7.9	915	8.2	915	8.6	915	9.0	878	9.4	878	9.8	878	10.3	907	10.7	907	11.2	907	11.7	1083	12.3	1083	12.9	1083	13.5	1214	14.3	1214	15	1214	15.7	0
7	428	9.5	0	9.9	915	10.3	915	10.7	915	11.2	878	11.8	878	12.3	878	12.9	907	13.4	907	13.9	907	14.7	$\boxed{542}$	15.4	1083	16.2	1083	16.9	1214	17.6	1214	18.3	1214	19.0	0
7	454	10.1	0	10.5	915	10.8	915	11.2	915	11.7	878	12.2	878	12.7	878	13.1	907	13.5	907	13.9	907	14.5	1083	15.1	1083	15.7	1083	16.3	1214	16.9	1214	17.5	1214	18.1	0
8	401	12.7	0	13.0	2810	13.2	2810	13.5	2810	13.9	2966	14.3	2966	14.7	2966	15.2	3254	15.7	3254	16.2	3254	16.7	3524	17.3	3524	17.8	3524	18.4	3915	19.0	3915	19.6	3915	20.2	0
8	433	9.7	0	10.3	2810	10.8	2810	11.5	2810	11.9	2966	12.2	2966	12.6	2966	13.1	3254	13.6	3254	14.1	3254	14.8	3524	15.5	3524	16.2	3524	16.5	3915	16.8	3915	17.1	3915	17.4	0
8	434	9.4	0	10.0	2810	10.8	2810	11.2	2810	11.6	2966	12.0	2966	12.4	2966	12.9	3254	13.3	3254	13.8	3254	14.3	3524	14.9	3524	15.4	3524	16.0	3915	16.7	3915	17.3	3915	17.9	0
8	435	10.5	0	11.2	2810	11.8	2810	12.8	2810	13.0	2966	13.5	2966	13.9	2966	14.3	3254	14.7	3254	15.1	3254	15.8	3524	16.5	3524	17.2	3524	17.7	3915	18.1	3915	18.6	3915	19.1	0
8	441	10.7	0	11.2	2810	11.6	2810	12.1	2810	12.6	2966	13.2	2966	13.7	2966	13.8	3254	14.0	3254	14.1	3254	14.5	3524	15.0	3524	15.4	3524	16.0	3915	16.5	3915	17.1	3915	17.7	0
9	403	11.4	0	11.8	7331	12.3	7331	12.7	7331	13.1	7898	13.4	7898	13.8	7898	14.3	8883	14.8	8883	15.3	8883	15.8	9747	16.2	9747	16.7	9747	17.4	10922	18.2	10922	18.9	10922	19.6	0
9	405	11.1	0	11.5	7331	11.9	7331	12.3	7331	12.7	7898	13.2	7898	13.6	7898	14.1	8883	14.5	8883	15	8883	15.7	9747	16.3	9747	17	9747	17.6	10922	18.3	10922	18.9	10922	19.5	0
9	413	8.8	0	8.5	7331	8.3	7331	8	7331	8.9	7898	9.7	7898	10.6	7898	11.0	8883	11.4	8883	11.8	8883	12.3	9747	12.7	9747	13.2	9747	13.7	10922	14.3	10922	14.8	10922	15.3	0
9	448	9.1	0	9.5	7331	9.9	7331	10.2	7331	10.6	7898	10.9	7898	11.3	7898	11.6	8883	12.0	8883	12.3	8883	12.9	9747	13.6	9747	14.2	9747	14.9	10922	15.5	10922	16.2	10922	16.9	0
9	453	8.9	0	9.4	7331	9.8	7331	10.3	7331	10.7	7898	11.1	7898	11.5	7898	11.9	8883	12.4	8883	12.8	8883	13.5	9747	14.1	9747	14.8	9747	15.5	10922	16.2	10922	16.9	10922	17.6	0
10	415																																		
10	421																																		
10	424																																		
10	425	9.9	0	10.2	1028	10.5	1028	10.8	1028	11.2	1118	11.4	1118	11.7	1118	12.2	1283	12.7	1283	13.2	1283	13.7	1343	14.3	1343	14.8	1343	15.3	1447	15.8	1447	16.3	1447	16.8	0
10	436	8.9	0	9.1	1028	9.3	1028	9.6	1028	10.0	1118	10.4	1118	10.8	1118	11.2	1283	11.6	1283	12	1283	12.6	1343	13.2	1343	13.8	1343	14.2	1447	14.7	1447	15.1	1447	15.5	0
10	439	10.1	0	10.4	1028	10.7	1028	11	1028	11.0	1118	11.1	1118	11.1	1118	11.4	1283	11.8	1283	12.1	1283	12.0	1343	11.9	1343	11.8	1343	12.5	1447	13.3	1447	14	$\boxed{796}$	14.7	0
10	445																																		
10	451																																		

Animal removed during course of study

Days which required adjustment due to deviations in dosing (i.e., Missed doses)

Day 9

Group 7 - Pig 428 did not receive one dose. Daily dose adjusted to 50%.

Day 14

Group 10 - Pig 439 did not receive most of one dose due to syringe coming off stopcock during injection. Daily dose adjusted to 55%.

* Groups 4, 5, & 6 not shown (data for samples from a different site)

TABLE A-2

Body Weight Adjusted Doses
(Dose for Day/BW for Day)

Group	ID #	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Avg Dose	Target Dose	% Target	Avg %
1	417	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0		
1	430	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0		
2	409	74.68	72.29	70.04	72.49	69.48	66.72	71.33	68.85	66.54	70.46	68.11	65.91	70.44	68.05	65.82	69.41	75	93	
2	419	68.49	67.56	66.65	70.21	68.42	66.72	72.02	70.15	68.38	72.34	69.86	67.55	74.20	73.59	73.00	69.94	75	93	
2	429	80.50	78.47	76.53	79.35	76.19	73.28	77.87	74.74	71.85	75.87	73.15	70.62	75.12	72.27	69.62	75.03	75	100	
2	443	90.82	87.00	83.48	87.36	84.61	82.02	88.00	85.23	82.63	87.70	84.96	82.39	87.49	84.03	80.84	85.24	75	114	
2	444	90.82	87.93	85.21	87.65	83.55	79.82	85.72	83.09	80.61	84.30	80.56	77.13	81.75	78.38	75.28	82.79	75	110	102
3	408	240.73	229.58	219.42	229.89	222.88	216.29	230.58	221.98	213.99	227.09	219.94	213.24	225.84	216.38	207.67	222.37	225	99	
3	410	226.09	222.71	219.42	229.89	222.88	216.29	232.99	226.48	220.33	233.04	225.00	217.50	234.64	228.70	223.06	225.27	225	100	
3	426	223.38	217.50	211.92	219.84	211.18	203.18	217.12	209.47	202.35	214.64	207.80	201.39	213.82	205.31	197.46	210.42	225	94	
3	449	222.04	218.87	211.92	222.27	215.71	209.53	225.34	218.71	212.46	223.97	215.58	207.80	228.32	222.60	219.00	218.01	225	97	
3	455	214.99	207.20	199.98	208.99	202.18	195.77	208.98	201.43	194.41	205.62	198.53	191.91	205.31	198.54	192.21	201.73	225	90	96
7	404	75.89	72.94	70.22	73.33	71.15	69.09	76.31	74.96	73.66	76.99	73.51	70.32	76.32	73.99	71.80	73.37	75	98	
7	406	80.11	78.62	77.57	78.82	74.58	70.77	77.72	75.92	74.21	78.86	76.45	74.18	80.01	77.13	74.45	76.64	75	102	
7	416	103.54	98.93	94.71	97.50	93.35	89.54	96.14	91.96	88.13	92.30	88.29	84.61	89.67	85.06	80.90	91.64	75	122	
7	428	82.27	79.08	76.12	78.12	74.58	71.34	76.91	73.84	71.01	36.92	70.17	66.65	71.80	68.95	68.31	70.95	75	95	
7	454	77.82	75.18	72.72	75.00	71.93	69.09	75.34	73.11	71.01	74.69	71.72	68.96	74.45	71.80	69.34	72.81	75	97	103
8	401	201.29	197.23	193.33	213.35	207.38	201.73	214.05	207.23	200.83	210.57	204.06	197.95	212.77	206.05	199.74	204.50	225	91	
8	433	253.40	239.45	226.96	249.90	242.41	235.36	248.36	239.23	230.74	238.07	227.32	217.50	237.27	233.04	228.95	238.53	225	105	
8	434	261.00	246.23	233.04	255.65	247.13	239.15	252.86	244.01	235.76	245.83	237.01	228.80	244.18	234.90	228.30	242.12	225	108	
8	435	233.04	219.33	207.14	227.53	220.21	213.35	227.52	221.33	215.48	223.01	213.55	204.85	221.60	215.90	210.48	218.29	225	97	
8	441	233.73	224.36	215.70	234.74	225.23	216.48	235.19	232.95	230.74	242.44	235.42	228.80	245.20	236.79	228.95	231.11	225	103	101
9	403	619.48	597.60	577.20	604.40	587.90	572.28	621.19	600.20	580.59	618.20	600.43	583.65	626.47	601.18	577.86	597.91	675	89	
9	405	637.43	616.01	595.98	620.22	599.81	580.70	631.49	611.22	592.20	622.15	596.76	573.35	619.37	597.89	577.86	604.83	675	90	
9	413	859.04	886.75	916.31	890.70	811.39	745.05	807.55	779.21	752.80	794.59	765.47	738.41	795.25	765.53	737.94	803.07	675	119	
9	446	774.35	745.47	718.68	747.40	722.33	698.69	763.58	742.31	722.20	753.63	718.45	688.41	734.63	703.10	674.17	727.04	675	108	
9	453	762.62	745.47	711.70	738.08	711.49	686.74	744.39	718.30	693.98	723.79	689.65	658.58	704.61	674.17	646.24	708.65	675	105	102
10	415																	100		
10	421																	100		
10	424																	100		
10	425	100.92	97.41	94.13	100.12	97.78	95.56	103.48	99.41	95.64	97.82	94.16	90.77	94.55	91.56	88.75	96.14	100	96	
10	438	113.16	109.93	106.68	111.80	107.50	103.52	112.72	108.84	105.21	106.61	101.77	97.34	101.64	98.64	95.81	105.42	100	105	
10	439	96.65	95.89	93.27	101.33	101.02	100.72	110.42	107.29	104.34	111.94	112.89	113.84	115.43	109.05	56.83	102.19	100	102	
10	445																	100		
10	451																	100		101

Animal removed during course of study

TABLE A - 3 RAW AND ADJUSTED BLOOD LEAD DATA BY DAY

PHASE II EXPERIMENT 4 (Data not shown for groups 4, 5, & 6)

pig number	sample	group	material administered	dosage	qualifier	Lab result (ug/L)	day	source file	MATRIX	Adjusted Value (ug/dL)[a]	Notes
417	8-904105	1	control	0	<	1	-4	a:pig31.da	BLOOD	0.5	
430	8-904153	1	control	0	<	1	-4	a:pig31.da	BLOOD	0.5	
409	8-904147	2	PbAc	75	<	1	-4	a:pig31.da	BLOOD	0.5	
419	8-904142	2	PbAc	75	<	1	-4	a:pig31.da	BLOOD	0.5	
429	8-904125	2	PbAc	75	<	1	-4	a:pig31.da	BLOOD	0.5	
443	8-904108	2	PbAc	75	<	1	-4	a:pig31.da	BLOOD	0.5	
444	8-904103	2	PbAc	75	<	1	-4	a:pig31.da	BLOOD	0.5	
408	8-904121	3	PbAc	225	<	1	-4	a:pig31.da	BLOOD	0.5	
410	8-904116	3	PbAc	225	<	1	-4	a:pig31.da	BLOOD	0.5	
426	8-904140	3	PbAc	225	<	1	-4	a:pig31.da	BLOOD	0.5	
449	8-904145	3	PbAc	225	<	1	-4	a:pig31.da	BLOOD	0.5	
455	8-904100	3	PbAc	225	<	1	-4	a:pig31.da	BLOOD	0.5	
404	8-904109	7	HL Mill	75	<	1	-4	a:pig31.da	BLOOD	0.5	
406	8-904134	7	HL Mill	75	<	1	-4	a:pig31.da	BLOOD	0.5	
416	8-904139	7	HL Mill	75	<	1	-4	a:pig31.da	BLOOD	0.5	
428	8-904133	7	HL Mill	75	<	1	-4	a:pig31.da	BLOOD	0.5	
454	8-904113	7	HL Mill	75	<	1	-4	a:pig31.da	BLOOD	0.5	
401	8-904138	8	HL Mill	225	<	1	-4	a:pig31.da	BLOOD	0.5	
433	8-904114	8	HL Mill	225	<	1	-4	a:pig31.da	BLOOD	0.5	
434	8-904112	8	HL Mill	225	<	1	-4	a:pig31.da	BLOOD	0.5	
435	8-904141	8	HL Mill	225	<	1	-4	a:pig31.da	BLOOD	0.5	
441	8-904126	8	HL Mill	225	<	1	-4	a:pig31.da	BLOOD	0.5	
403	8-904136	9	HL Mill	675	<	1	-4	a:pig31.da	BLOOD	0.5	
405	8-904102	9	HL Mill	675	<	1	-4	a:pig31.da	BLOOD	0.5	
413	8-904132	9	HL Mill	675	<	1	-4	a:pig31.da	BLOOD	0.5	
448	8-904148	9	HL Mill	675	<	1	-4	a:pig31.da	BLOOD	0.5	
453	8-904154	9	HL Mill	675	<	1	-4	a:pig31.da	BLOOD	0.5	
415	8-904120	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
421	8-904127	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
424	8-904137	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
425	8-904117	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
438	8-904152	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
439	8-904119	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
445	8-904135	10	IV	100	<	1	-4	a:pig31.da	BLOOD	0.5	
451	8-904143	10	IV	100			-4		BLOOD		removed
417	8-904180	1	control	0	<	1	0	a:pig31.da	BLOOD	0.5	
430	8-904179	1	control	0	<	1	0	a:pig31.da	BLOOD	0.5	
409	8-904169	2	PbAc	75	<	1	0	a:pig31.da	BLOOD	0.5	
419	8-904185	2	PbAc	75	<	1	0	a:pig31.da	BLOOD	0.5	
429	8-904172	2	PbAc	75	<	1	0	a:pig31.da	BLOOD	0.5	
443	8-904181	2	PbAc	75	<	1	0	a:pig31.da	BLOOD	0.5	
444	8-904193	2	PbAc	75	<	1	0	a:pig31.da	BLOOD	0.5	
408	8-904173	3	PbAc	225	<	1	0	a:pig31.da	BLOOD	0.5	
410	8-904200	3	PbAc	225	<	1	0	a:pig31.da	BLOOD	0.5	
426	8-904205	3	PbAc	225	<	1	0	a:pig31.da	BLOOD	0.5	
449	8-904176	3	PbAc	225	<	1	0	a:pig31.da	BLOOD	0.5	
455	8-904161	3	PbAc	225	<	1	0	a:pig31.da	BLOOD	0.5	
404	8-904167	7	HL Mill	75	<	1	0	a:pig31.da	BLOOD	0.5	
406	8-904158	7	HL Mill	75	<	1	0	a:pig31.da	BLOOD	0.5	
416	8-904155	7	HL Mill	75	<	1	0	a:pig31.da	BLOOD	0.5	
428	8-904168	7	HL Mill	75	<	1	0	a:pig31.da	BLOOD	0.5	
454	8-904156	7	HL Mill	75	<	1	0	a:pig31.da	BLOOD	0.5	
401	8-904207	8	HL Mill	225	<	1	0	a:pig31.da	BLOOD	0.5	
433	8-904198	8	HL Mill	225	<	1	0	a:pig31.da	BLOOD	0.5	
434	8-904195	8	HL Mill	225	<	1	0	a:pig31.da	BLOOD	0.5	
435	8-904170	8	HL Mill	225	<	1	0	a:pig31.da	BLOOD	0.5	
441	8-904177	8	HL Mill	225	<	1	0	a:pig31.da	BLOOD	0.5	
403	8-904184	9	HL Mill	675	<	1	0	a:pig31.da	BLOOD	0.5	
405	8-904164	9	HL Mill	675	<	1	0	a:pig31.da	BLOOD	0.5	
413	8-904209	9	HL Mill	675	<	1	0	a:pig31.da	BLOOD	0.5	
448	8-904159	9	HL Mill	675	<	1	0	a:pig31.da	BLOOD	0.5	
453	8-904191	9	HL Mill	675	<	1	0	a:pig31.da	BLOOD	0.5	
415	8-904192	10	IV	100		5	0	a:pig31.da	BLOOD	5	
421	8-904202	10	IV	100			0		BLOOD		removed
424	8-904194	10	IV	100	<	1	0	a:pig31.da	BLOOD	0.5	
425	8-904157	10	IV	100	<	1	0	a:pig31.da	BLOOD	0.5	
438	8-904196	10	IV	100	<	1	0	a:pig31.da	BLOOD	0.5	
439	8-904204	10	IV	100	<	1	0	a:pig31.da	BLOOD	0.5	
445	8-904163	10	IV	100	<	1	0	a:pig31.da	BLOOD	0.5	
451	8-904183	10	IV	100			0		BLOOD		removed
417	8-904243	1	control	0	<	1	1	a:pig32.da	BLOOD	0.5	
430	8-904226	1	control	0	<	1	1	a:pig32.da	BLOOD	0.5	
409	8-904248	2	PbAc	75	<	1	1	a:pig32.da	BLOOD	0.5	
419	8-904237	2	PbAc	75		2.7	1	a:pig32.da	BLOOD	2.7	
429	8-904232	2	PbAc	75	<	1	1	a:pig32.da	BLOOD	0.5	
443	8-904250	2	PbAc	75	<	1	1	a:pig32.da	BLOOD	0.5	
444	8-904236	2	PbAc	75	<	1	1	a:pig32.da	BLOOD	0.5	

pig number	sample	group	material administered	dosage	qualifier	(ug/L)	day	source file	MATRIX	(ug/dL)[a]	Notes
408	8-904252	3	PbAc	225		1.4	1	a:pig32.da	BLOOD	1.4	
410	8-904220	3	PbAc	225		5	1	a:pig32.da	BLOOD	5	
426	8-904217	3	PbAc	225		2.8	1	a:pig32.da	BLOOD	2.8	
449	8-904216	3	PbAc	225		7.3	1	a:pig32.da	BLOOD	7.3	
455	8-904213	3	PbAc	225		3.1	1	a:pig32.da	BLOOD	3.1	
404	8-904244	7	HL Mill	75		1.3	1	a:pig32.da	BLOOD	1.3	
406	8-904247	7	HL Mill	75	<	1	1	a:pig32.da	BLOOD	0.5	
416	8-904233	7	HL Mill	75	<	1	1	a:pig32.da	BLOOD	0.5	
428	8-904235	7	HL Mill	75		2.3	1	a:pig32.da	BLOOD	2.3	
454	8-904212	7	HL Mill	75	<	1	1	a:pig32.da	BLOOD	0.5	
401	8-904264	8	HL Mill	225		5.2	1	a:pig32.da	BLOOD	5.2	
433	8-904261	8	HL Mill	225		5.1	1	a:pig32.da	BLOOD	5.1	
434	8-904251	8	HL Mill	225		4.9	1	a:pig32.da	BLOOD	4.9	
435	8-904245	8	HL Mill	225		5.7	1	a:pig32.da	BLOOD	5.7	
441	8-904234	8	HL Mill	225		2.8	1	a:pig32.da	BLOOD	2.8	
403	8-904260	9	HL Mill	675		3.7	1	a:pig32.da	BLOOD	3.7	
405	8-904262	9	HL Mill	675		5.8	1	a:pig32.da	BLOOD	5.8	
413	8-904228	9	HL Mill	675		7.4	1	a:pig32.da	BLOOD	7.4	
448	8-904230	9	HL Mill	675		5.8	1	a:pig32.da	BLOOD	5.8	
453	8-904254	9	HL Mill	675		2.3	1	a:pig32.da	BLOOD	2.3	
415	8-904219	10	IV	100		6.6	1	a:pig32.da	BLOOD	6.6	
421	8-904222	10	IV	100			1		BLOOD		removed
424	8-904253	10	IV	100		6.4	1	a:pig32.da	BLOOD	6.4	
425	8-904257	10	IV	100		5.3	1	a:pig32.da	BLOOD	5.3	
438	8-904246	10	IV	100		3.9	1	a:pig32.da	BLOOD	3.9	
439	8-904225	10	IV	100		5.7	1	a:pig32.da	BLOOD	5.7	
445	8-904210	10	IV	100			1		BLOOD		removed
451	8-904249	10	IV	100			1		BLOOD		removed
417	8-904267	1	control	0	<	1	2	a:pig32.da	BLOOD	0.5	
430	8-904314	1	control	0	<	1	2	a:pig32.da	BLOOD	0.5	
409	8-904283	2	PbAc	75		1	2	a:pig32.da	BLOOD	1	
419	8-904303	2	PbAc	75		4	2	a:pig32.da	BLOOD	4	
429	8-904275	2	PbAc	75		1.9	2	a:pig32.da	BLOOD	1.9	
443	8-904279	2	PbAc	75	<	1	2	a:pig32.da	BLOOD	0.5	
444	8-904311	2	PbAc	75		1.2	2	a:pig32.da	BLOOD	1.2	
408	8-904288	3	PbAc	225		2.5	2	a:pig32.da	BLOOD	2.5	
410	8-904271	3	PbAc	225		5.8	2	a:pig32.da	BLOOD	5.8	
426	8-904266	3	PbAc	225		4.8	2	a:pig32.da	BLOOD	4.8	
449	8-904289	3	PbAc	225		10.5	2	a:pig32.da	BLOOD	10.5	
455	8-904306	3	PbAc	225		5.4	2	a:pig32.da	BLOOD	5.4	
404	8-904270	7	HL Mill	75		2.3	2	a:pig32.da	BLOOD	2.3	
406	8-904316	7	HL Mill	75		1.2	2	a:pig32.da	BLOOD	1.2	
416	8-904285	7	HL Mill	75		1	2	a:pig32.da	BLOOD	1	
428	8-904274	7	HL Mill	75		2.9	2	a:pig32.da	BLOOD	2.9	
454	8-904296	7	HL Mill	75	<	1	2	a:pig32.da	BLOOD	0.5	
401	8-904304	8	HL Mill	225		7.2	2	a:pig32.da	BLOOD	7.2	
433	8-904317	8	HL Mill	225		6.8	2	a:pig32.da	BLOOD	6.8	
434	8-904318	8	HL Mill	225		5.9	2	a:pig32.da	BLOOD	5.9	
435	8-904277	8	HL Mill	225		7	2	a:pig32.da	BLOOD	7	
441	8-904286	8	HL Mill	225		4	2	a:pig32.da	BLOOD	4	
403	8-904278	9	HL Mill	675		7.7	2	a:pig32.da	BLOOD	7.7	
405	8-904307	9	HL Mill	675		7	2	a:pig32.da	BLOOD	7	
413	8-904291	9	HL Mill	675		13.1	2	a:pig32.da	BLOOD	13.1	
448	8-904290	9	HL Mill	675		7	2	a:pig32.da	BLOOD	7	
453	8-904298	9	HL Mill	675		5.8	2	a:pig32.da	BLOOD	5.8	
415	8-904301	10	IV	100		8	2	a:pig32.da	BLOOD	8	
421	8-904276	10	IV	100			2		BLOOD		removed
424	8-904281	10	IV	100		7.6	2	a:pig32.da	BLOOD	7.6	
425	8-904292	10	IV	100		7.6	2	a:pig32.da	BLOOD	7.6	
438	8-904309	10	IV	100		6.6	2	a:pig32.da	BLOOD	6.6	
439	8-904319	10	IV	100		6.3	2	a:pig32.da	BLOOD	6.3	
445	8-904282	10	IV	100			2		BLOOD		removed
451	8-904293	10	IV	100			2		BLOOD		removed
417	8-904334	1	control	0	<	1	3	a:pig32.da	BLOOD	0.5	
430	8-904358	1	control	0	<	1	3	a:pig32.da	BLOOD	0.5	
409	8-904355	2	PbAc	75		1.5	3	a:pig32.da	BLOOD	1.5	
419	8-904357	2	PbAc	75		3.9	3	a:pig32.da	BLOOD	3.9	
429	8-904346	2	PbAc	75		2.5	3	a:pig32.da	BLOOD	2.5	
443	8-904320	2	PbAc	75		1.5	3	a:pig32.da	BLOOD	1.5	
444	8-904333	2	PbAc	75		1.7	3	a:pig32.da	BLOOD	1.7	
408	8-904332	3	PbAc	225		4.9	3	a:pig32.da	BLOOD	4.9	
410	8-904336	3	PbAc	225		8.1	3	a:pig32.da	BLOOD	8.1	
426	8-904368	3	PbAc	225		5.3	3	a:pig32.da	BLOOD	5.3	
449	8-904364	3	PbAc	225		10.2	3	a:pig32.da	BLOOD	10.2	
455	8-904335	3	PbAc	225		5.8	3	a:pig32.da	BLOOD	5.8	
404	8-904374	7	HL Mill	75		3.3	3	a:pig32.da	BLOOD	3.3	
406	8-904337	7	HL Mill	75		2.7	3	a:pig32.da	BLOOD	2.7	
416	8-904371	7	HL Mill	75		2.8	3	a:pig32.da	BLOOD	2.8	
428	8-904328	7	HL Mill	75		5.3	3	a:pig32.da	BLOOD	5.3	
454	8-904350	7	HL Mill	75		1.6	3	a:pig32.da	BLOOD	1.6	
401	8-904330	8	HL Mill	225		8.3	3	a:pig32.da	BLOOD	8.3	
433	8-904356	8	HL Mill	225			3		BLOOD		Tube Broke
434	8-904341	8	HL Mill	225		7	3	a:pig32.da	BLOOD	7	

pig number	sample	group	material administered	dosage	qualifier	(ug/L)	day	source file	MATRIX	(ug/dL)*	Notes
435	8-904329	8	HL Mill	225		8.6	3	a:pig32.da	BLOOD	8.6	
441	8-904360	8	HL Mill	225		3.2	3	a:pig32.da	BLOOD	3.2	
403	8-904344	9	HL Mill	675		7.8	3	a:pig32.da	BLOOD	7.8	
405	8-904347	9	HL Mill	675		6.6	3	a:pig32.da	BLOOD	6.6	
413	8-904342	9	HL Mill	675		10.3	3	a:pig32.da	BLOOD	10.3	
448	8-904331	9	HL Mill	675		8.9	3	a:pig32.da	BLOOD	8.9	
453	8-904324	9	HL Mill	675		5.8	3	a:pig32.da	BLOOD	5.8	
415	8-904354	10	IV	100		9.7	3	a:pig32.da	BLOOD	9.7	
421	8-904321	10	IV	100			3		BLOOD		removed
424	8-904370	10	IV	100		6.6	3	a:pig32.da	BLOOD	6.6	
425	8-904345	10	IV	100		7.6	3	a:pig32.da	BLOOD	7.6	
438	8-904326	10	IV	100		7.3	3	a:pig32.da	BLOOD	7.3	
439	8-904353	10	IV	100		6.8	3	a:pig32.da	BLOOD	6.8	
445	8-904348	10	IV	100			3		BLOOD		removed
451	8-904365	10	IV	100			3		BLOOD		removed
417	8-904447	1	control	0	<	1	5	a:pig32.da	BLOOD	0.5	
430	8-904417	1	control	0	<	1	5	a:pig32.da	BLOOD	0.5	
409	8-904421	2	PbAc	75		2.4	5	a:pig32.da	BLOOD	2.4	
419	8-904440	2	PbAc	75		5.6	5	a:pig32.da	BLOOD	5.6	
429	8-904420	2	PbAc	75		3.1	5	a:pig32.da	BLOOD	3.1	
443	8-904409	2	PbAc	75		2	5	a:pig32.da	BLOOD	2	
444	8-904444	2	PbAc	75		2.1	5	a:pig32.da	BLOOD	2.1	
408	8-904426	3	PbAc	225		4.5	5	a:pig32.da	BLOOD	4.5	
410	8-904435	3	PbAc	225		7.4	5	a:pig32.da	BLOOD	7.4	
426	8-904423	3	PbAc	225		8	5	a:pig32.da	BLOOD	8	
449	8-904422	3	PbAc	225		13.1	5	a:pig32.da	BLOOD	13.1	
455	8-904393	3	PbAc	225		7	5	a:pig32.da	BLOOD	7	
404	8-904416	7	HL Mill	75		4.2	5	a:pig32.da	BLOOD	4.2	
406	8-904401	7	HL Mill	75		2.3	5	a:pig32.da	BLOOD	2.3	
416	8-904441	7	HL Mill	75		2.6	5	a:pig32.da	BLOOD	2.6	
428	8-904432	7	HL Mill	75		4	5	a:pig32.da	BLOOD	4	
454	8-904419	7	HL Mill	75		2.5	5	a:pig32.da	BLOOD	2.5	
401	8-904431	8	HL Mill	225		7.3	5	a:pig32.da	BLOOD	7.3	
433	8-904406	8	HL Mill	225		6.6	5	a:pig32.da	BLOOD	6.6	
434	8-904396	8	HL Mill	225		7.7	5	a:pig32.da	BLOOD	7.7	
435	8-904428	8	HL Mill	225		7.8	5	a:pig32.da	BLOOD	7.8	
441	8-904412	8	HL Mill	225		4.3	5	a:pig32.da	BLOOD	4.3	
403	8-904445	9	HL Mill	675		8.2	5	a:pig32.da	BLOOD	8.2	
405	8-904438	9	HL Mill	675		8.1	5	a:pig32.da	BLOOD	8.1	
413	8-904408	9	HL Mill	675		12.8	5	a:pig32.da	BLOOD	12.8	
448	8-904418	9	HL Mill	675		10	5	a:pig32.da	BLOOD	10	
453	8-904437	9	HL Mill	675		8.4	5	a:pig32.da	BLOOD	8.4	
415	8-904446	10	IV	100		8.4	5	a:pig32.da	BLOOD	8.4	
421	8-904404	10	IV	100			5		BLOOD		removed
424	8-904413	10	IV	100			5		BLOOD		removed
425	8-904411	10	IV	100		8.7	5	a:pig32.da	BLOOD	8.7	
438	8-904433	10	IV	100		8.2	5	a:pig32.da	BLOOD	8.2	
439	8-904442	10	IV	100		8.5	5	a:pig32.da	BLOOD	8.5	
445	8-904439	10	IV	100			5		BLOOD		removed
451	8-904403	10	IV	100			5		BLOOD		removed
417	8-904481	1	control	0	<	1	7	a:pig35.da	BLOOD	0.5	
430	8-904456	1	control	0	<	1	7	a:pig35.da	BLOOD	0.5	
409	8-904485	2	PbAc	75		3.4	7	a:pig35.da	BLOOD	3.4	
419	8-904497	2	PbAc	75		6.6	7	a:pig35.da	BLOOD	6.6	
429	8-904453	2	PbAc	75		5.1	7	a:pig35.da	BLOOD	5.1	
443	8-904452	2	PbAc	75		2.5	7	a:pig35.da	BLOOD	2.5	
444	8-904449	2	PbAc	75		3.4	7	a:pig35.da	BLOOD	3.4	
408	8-904454	3	PbAc	225		8.9	7	a:pig35.da	BLOOD	8.9	
410	8-904458	3	PbAc	225		9.7	7	a:pig35.da	BLOOD	9.7	
426	8-904451	3	PbAc	225		8.9	7	a:pig35.da	BLOOD	8.9	
449	8-904502	3	PbAc	225		15.6	7	a:pig35.da	BLOOD	15.6	
455	8-904450	3	PbAc	225		7.4	7	a:pig35.da	BLOOD	7.4	
404	8-904463	7	HL Mill	75		4.7	7	a:pig35.da	BLOOD	4.7	
406	8-904477	7	HL Mill	75		4.7	7	a:pig35.da	BLOOD	4.7	
416	8-904470	7	HL Mill	75		3.5	7	a:pig35.da	BLOOD	3.5	
428	8-904490	7	HL Mill	75		4.3	7	a:pig35.da	BLOOD	4.3	
454	8-904499	7	HL Mill	75		2.6	7	a:pig35.da	BLOOD	2.6	
401	8-904474	8	HL Mill	225		9.6	7	a:pig35.da	BLOOD	9.6	
433	8-904461	8	HL Mill	225		7.1	7	a:pig35.da	BLOOD	7.1	
434	8-904460	8	HL Mill	225		7.1	7	a:pig35.da	BLOOD	7.1	
435	8-904469	8	HL Mill	225		8.2	7	a:pig35.da	BLOOD	8.2	
441	8-904466	8	HL Mill	225		3	7	a:pig35.da	BLOOD	3	
403	8-904457	9	HL Mill	675		10.9	7	a:pig35.da	BLOOD	10.9	
405	8-904491	9	HL Mill	675		10.6	7	a:pig35.da	BLOOD	10.6	
413	8-904489	9	HL Mill	675		13.2	7	a:pig35.da	BLOOD	13.2	
448	8-904448	9	HL Mill	675		11.8	7	a:pig35.da	BLOOD	11.8	
453	8-904488	9	HL Mill	675		10.1	7	a:pig35.da	BLOOD	10.1	
415	8-904464	10	IV	100			7		BLOOD		removed
421	8-904495	10	IV	100			7		BLOOD		removed
424	8-904501	10	IV	100			7		BLOOD		removed
425	8-904479	10	IV	100		8.9	7	a:pig35.da	BLOOD	8.9	
438	8-904494	10	IV	100		9.3	7	a:pig35.da	BLOOD	9.3	
439	8-904473	10	IV	100		9.3	7	a:pig35.da	BLOOD	9.3	

pig number	sample	group	material administered	dosage	qualifier	(ug/L)	day	source file	MATRIX	(ug/dL)[a]	Notes
445	8-904493	10	IV	100			7		BLOOD		removed
451	8-904496	10	IV	100			7		BLOOD		removed
417	8-904516	1	control	0	<	1	9	a:pig34.da	BLOOD	0.5	
430	8-904552	1	control	0	<	1	9	a:pig34.da	BLOOD	0.5	
409	8-904542	2	PbAc	75		4.9	9	a:pig34.da	BLOOD	4.9	
419	8-904530	2	PbAc	75		9.3	9	a:pig34.da	BLOOD	9.3	
429	8-904520	2	PbAc	75		5.6	9	a:pig34.da	BLOOD	5.6	
443	8-904517	2	PbAc	75		3.5	9	a:pig34.da	BLOOD	3.5	
444	8-904553	2	PbAc	75		4.4	9	a:pig34.da	BLOOD	4.4	
408	8-904503	3	PbAc	225		9.2	9	a:pig34.da	BLOOD	9.2	
410	8-904529	3	PbAc	225		9	9	a:pig34.da	BLOOD	9	
426	8-904507	3	PbAc	225		8.2	9	a:pig34.da	BLOOD	8.2	
449	8-904506	3	PbAc	225		12.6	9	a:pig34.da	BLOOD	12.6	
455	8-904511	3	PbAc	225		7.9	9	a:pig34.da	BLOOD	7.9	
404	8-904532	7	HL Mill	75		5.8	9	a:pig34.da	BLOOD	5.8	
406	8-904525	7	HL Mill	75		5.4	9	a:pig34.da	BLOOD	5.4	
416	8-904541	7	HL Mill	75		4.7	9	a:pig34.da	BLOOD	4.7	
428	8-904547	7	HL Mill	75		5.2	9	a:pig34.da	BLOOD	5.2	
454	8-904557	7	HL Mill	75		3.2	9	a:pig34.da	BLOOD	3.2	
401	8-904521	8	HL Mill	225		8.4	9	a:pig34.da	BLOOD	8.4	
433	8-904548	8	HL Mill	225		9.7	9	a:pig34.da	BLOOD	9.7	
434	8-904543	8	HL Mill	225		8.7	9	a:pig34.da	BLOOD	8.7	
435	8-904518	8	HL Mill	225		10.4	9	a:pig34.da	BLOOD	10.4	
441	8-904545	8	HL Mill	225		3.4	9	a:pig34.da	BLOOD	3.4	
403	8-904539	9	HL Mill	675		12.9	9	a:pig34.da	BLOOD	12.9	
405	8-904505	9	HL Mill	675		11	9	a:pig34.da	BLOOD	11	
413	8-904515	9	HL Mill	675		14.4	9	a:pig34.da	BLOOD	14.4	
448	8-904528	9	HL Mill	675		13.7	9	a:pig34.da	BLOOD	13.7	
453	8-904509	9	HL Mill	675		11.3	9	a:pig34.da	BLOOD	11.3	
415	8-904550	10	IV	100			9		BLOOD		removed
421	8-904526	10	IV	100			9		BLOOD		removed
424	8-904522	10	IV	100			9		BLOOD		removed
425	8-904527	10	IV	100		10.9	9	a:pig34.da	BLOOD	10.9	
438	8-904531	10	IV	100		11.3	9	a:pig34.da	BLOOD	11.3	
439	8-904538	10	IV	100		11.5	9	a:pig34.da	BLOOD	11.5	
445	8-904535	10	IV	100			9		BLOOD		removed
451	8-904540	10	IV	100			9		BLOOD		removed
417	8-904612	1	control	0	<	1	12	a:pig38.da	BLOOD	0.5	
430	8-904574	1	control	0	<	1	12	a:pig38.da	BLOOD	0.5	
409	8-904579	2	PbAc	75		5.3	12	a:pig38.da	BLOOD	5.3	
419	8-904563	2	PbAc	75		8.8	12	a:pig38.da	BLOOD	8.8	
429	8-904591	2	PbAc	75		6.2	12	a:pig38.da	BLOOD	6.2	
443	8-904599	2	PbAc	75		4	12	a:pig38.da	BLOOD	4	
444	8-904593	2	PbAc	75		4.7	12	a:pig38.da	BLOOD	4.7	
408	8-904606	3	PbAc	225		11.4	12	a:pig38.da	BLOOD	11.4	
410	8-904584	3	PbAc	225		11.7	12	a:pig38.da	BLOOD	11.7	
426	8-904576	3	PbAc	225		7.8	12	a:pig38.da	BLOOD	7.8	
449	8-904570	3	PbAc	225		14.7	12	a:pig38.da	BLOOD	14.7	
455	8-904594	3	PbAc	225		7.9	12	a:pig38.da	BLOOD	7.9	
404	8-904581	7	HL Mill	75		6.8	12	a:pig38.da	BLOOD	6.8	
406	8-904610	7	HL Mill	75		7.1	12	a:pig38.da	BLOOD	7.1	
416	8-904589	7	HL Mill	75		4.9	12	a:pig38.da	BLOOD	4.9	
428	8-904577	7	HL Mill	75		4.5	12	a:pig38.da	BLOOD	4.5	
454	8-904571	7	HL Mill	75		4.3	12	a:pig38.da	BLOOD	4.3	
401	8-904566	8	HL Mill	225		10.9	12	a:pig38.da	BLOOD	10.9	
433	8-904604	8	HL Mill	225		7.8	12	a:pig38.da	BLOOD	7.8	
434	8-904603	8	HL Mill	225		9.4	12	a:pig38.da	BLOOD	9.4	
435	8-904559	8	HL Mill	225		9.7	12	a:pig38.da	BLOOD	9.7	
441	8-904588	8	HL Mill	225		5.2	12	a:pig38.da	BLOOD	5.2	
403	8-904578	9	HL Mill	675		11.9	12	a:pig38.da	BLOOD	11.9	
405	8-904583	9	HL Mill	675		12.5	12	a:pig38.da	BLOOD	12.5	
413	8-904596	9	HL Mill	675		16.2	12	a:pig38.da	BLOOD	16.2	
448	8-904567	9	HL Mill	675		13.5	12	a:pig38.da	BLOOD	13.5	
453	8-904561	9	HL Mill	675		13.6	12	a:pig38.da	BLOOD	13.6	
415	8-904558	10	IV	100			12		BLOOD		removed
421	8-904572	10	IV	100			12		BLOOD		removed
424	8-904582	10	IV	100			12		BLOOD		removed
425	8-904592	10	IV	100		10.5	12	a:pig38.da	BLOOD	10.5	
438	8-904568	10	IV	100		11.4	12	a:pig38.da	BLOOD	11.4	
439	8-904580	10	IV	100		12.8	12	a:pig38.da	BLOOD	12.8	
445	8-904607	10	IV	100			12		BLOOD		removed
451	8-904608	10	IV	100			12		BLOOD		removed
417	8-904650	1	control	0	<	1	15	a:pig38.da	BLOOD	0.5	
430	8-904634	1	control	0	<	1	15	a:pig38.da	BLOOD	0.5	
409	8-904619	2	PbAc	75		4.3	15	a:pig38.da	BLOOD	4.3	
419	8-904656	2	PbAc	75		8.2	15	a:pig38.da	BLOOD	8.2	
429	8-904661	2	PbAc	75		6	15	a:pig38.da	BLOOD	6	
443	8-904624	2	PbAc	75		4.5	15	a:pig38.da	BLOOD	4.5	
444	8-904636	2	PbAc	75		5.2	15	a:pig38.da	BLOOD	5.2	
408	8-904647	3	PbAc	225		9.5	15	a:pig38.da	BLOOD	9.5	
410	8-904641	3	PbAc	225		12.8	15	a:pig38.da	BLOOD	12.8	
426	8-904628	3	PbAc	225		8.1	15	a:pig38.da	BLOOD	8.1	

pig number	sample	group	material administered	dosage	qualifier	(ug/L)	day	source file	MATRIX	(ug/dL)[a]	Notes
449	8-904665	3	PbAc	225		11.7	15	a:pig38.da	BLOOD	11.7	
455	8-904667	3	PbAc	225		8.4	15	a:pig38.da	BLOOD	8.4	
404	8-904664	7	HL Mill	75		5.1	15	a:pig38.da	BLOOD	5.1	
406	8-904623	7	HL Mill	75		6.3	15	a:pig38.da	BLOOD	6.3	
416	8-904625	7	HL Mill	75		5.1	15	a:pig38.da	BLOOD	5.1	
428	8-904648	7	HL Mill	75	<	1	15	a:pig38.da	BLOOD	0.5	
454	8-904635	7	HL Mill	75		2.4	15	a:pig38.da	BLOOD	2.4	
401	8-904649	8	HL Mill	225		10.3	15	a:pig38.da	BLOOD	10.3	
433	8-904627	8	HL Mill	225		7.9	15	a:pig38.da	BLOOD	7.9	
434	8-904645	8	HL Mill	225		8	15	a:pig38.da	BLOOD	8	
435	8-904620	8	HL Mill	225		11.3	15	a:pig38.da	BLOOD	11.3	
441	8-904643	8	HL Mill	225		5.4	15	a:pig38.da	BLOOD	5.4	
403	8-904660	9	HL Mill	675		10.6	15	a:pig38.da	BLOOD	10.6	
405	8-904663	9	HL Mill	675		15.2	15	a:pig38.da	BLOOD	15.2	
413	8-904651	9	HL Mill	675		16.9	15	a:pig38.da	BLOOD	16.9	
448	8-904654	9	HL Mill	675		12.7	15	a:pig38.da	BLOOD	12.7	
453	8-904639	9	HL Mill	675		13	15	a:pig38.da	BLOOD	13	
415	8-904613	10	IV	100			15		BLOOD		removed
421	8-904637	10	IV	100			15		BLOOD		removed
424	8-904659	10	IV	100			15		BLOOD		removed
425	8-904657	10	IV	100		10.7	15	a:pig38.da	BLOOD	10.7	
438	8-904626	10	IV	100		11	15	a:pig38.da	BLOOD	11	
439	8-904642	10	IV	100		13.6	15	a:pig38.da	BLOOD	13.6	
445	8-904629	10	IV	100			15		BLOOD		removed
451	8-904614	10	IV	100			15		BLOOD		removed

a Non-detects evaluated using 1/2 the quantitation limit; laboratory results (ug/L) converted to concentration in blood (ug/dL) by dividing by dilution factor of 1 dl/L

TABLE A-4 BLOOD LEAD OUTLIERS

Flagged Data Points
Outliers

test material	target dosage	Actual Dose*	group	pig#	BLOOD LEAD (ug/dL) BY DAY -4	0	1	2	3	5	7	9	12	15
control	0	0.00	1	417	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
control	0	0.00	1	430	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PbAc	75	69.41	2	409	0.5	0.5	0.5	1	1.5	2.4	3.4	4.9	5.3	4.3
PbAc	75	69.94	2	419	0.5	0.5	2.7	4	3.9	5.6	6.6	9.3	8.8	8.2
PbAc	75	75.03	2	429	0.5	0.5	0.5	1.9	2.5	3.1	5.1	5.6	6.2	6
PbAc	75	85.24	2	443	0.5	0.5	0.5	0.5	1.5	2	2.5	3.5	4	4.5
PbAc	75	82.79	2	444	0.5	0.5	0.5	1.2	1.7	2.1	3.4	4.4	4.7	5.2
PbAc	225	222.37	3	408	0.5	0.5	1.4	2.5	4.9	4.5	8.9	9.2	11.4	9.5
PbAc	225	225.27	3	410	0.5	0.5	5	5.8	8.1	7.4	9.7	9	11.7	12.8
PbAc	225	210.42	3	426	0.5	0.5	2.8	4.8	5.3	8	8.9	8.2	7.8	8.1
PbAc	225	218.01	3	449	0.5	0.5	7.3	10.5	10.2	13.1	15.6	12.6	14.7	11.7
PbAc	225	201.73	3	455	0.5	0.5	3.1	5.4	5.8	7	7.4	7.9	7.9	8.4
HL Mill	75	73.37	7	404	0.5	0.5	1.3	2.3	3.3	4.2	4.7	5.8	6.8	5.1
HL Mill	75	76.64	7	406	0.5	0.5	0.5	1.2	2.7	2.3	4.7	5.4	7.1	6.3
HL Mill	75	91.64	7	416	0.5	0.5	0.5	1	2.8	2.6	3.5	4.7	4.9	5.1
HL Mill	75	70.95	7	428	0.5	0.5	2.3	2.9	5.3	4	4.3	5.2	4.5	0.5
HL Mill	75	72.81	7	454	0.5	0.5	0.5	0.5	1.6	2.5	2.6	3.2	4.3	2.4
HL Mill	225	204.50	8	401	0.5	0.5	5.2	7.2	8.3	7.3	9.6	8.4	10.9	10.3
HL Mill	225	236.53	8	433	0.5	0.5	5.1	6.8	Missing	6.6	7.1	9.7	7.8	7.9
HL Mill	225	242.12	8	434	0.5	0.5	4.9	5.9	7	7.7	7.1	8.7	9.4	8
HL Mill	225	218.29	8	435	0.5	0.5	5.7	7	8.6	7.8	8.2	10.4	9.7	11.3
HL Mill	225	231.11	8	441	0.5	0.5	2.8	4	3.2	4.3	3	3.4	5.2	5.4
HL Mill	675	597.91	9	403	0.5	0.5	3.7	7.7	7.8	8.2	10.9	12.9	11.9	10.6
HL Mill	675	604.83	9	405	0.5	0.5	5.8	7	6.6	8.1	10.6	11	12.5	15.2
HL Mill	675	803.07	9	413	0.5	0.5	7.4	13.1	10.3	12.8	13.2	14.4	16.2	16.9
HL Mill	675	727.04	9	448	0.5	0.5	5.8	7	8.9	10	11.8	13.7	13.5	12.7
HL Mill	675	708.65	9	453	0.5	0.5	2.3	5.8	5.6	8.4	10.1	11.3	13.6	13
IV	100		10	415										
IV	100		10	421										
IV	100		10	424										
IV	100	96.14	10	425	0.5	0.5	5.3	7.6	7.6	8.7	8.9	10.9	10.5	10.7
IV	100	105.42	10	438	0.5	0.5	3.9	6.6	7.3	8.2	9.3	11.3	11.4	11
IV	100	102.19	10	439	0.5	0.5	5.7	6.3	6.8	8.5	9.3	11.5	12.8	13.6
IV	100		10	445										
IV	100		10	451										

*** Average Time and Weight-Adjusted Dose for Each Pig**

Animal removed from study

TABLE A-5 RATIONALE FOR OUTLIER DECISIONS - PBB BY DAY

Pig # 428 Day 15	Value was below the detection limit on day 15 of the study. This is unexpected when compared to the individual animals dose-response time trend, and is considered anomalous. This value has been excluded and was interpolated to a value Of 3.8

TABLE A-6 Area Under Curve Determinations

Calculated using interpolated values for excluded data as noted in Table A-5

		AUC (ug/dL-days) For Time Span Shown								
group	pig#	0-1	1-2	2-3	3-5	5-7	7-9	9-12	12-15	AUC Total (ug/dL-days)
1	417	0.50	0.50	0.50	1.00	1.00	1.00	1.50	1.50	7.50
1	430	0.50	0.50	0.50	1.00	1.00	1.00	1.50	1.50	7.50
2	409	0.50	0.75	1.25	3.90	5.80	8.30	15.30	14.40	50.20
2	419	1.60	3.35	3.95	9.50	12.20	15.90	27.15	25.50	99.15
2	429	0.50	1.20	2.20	5.60	8.20	10.70	17.70	18.30	64.40
2	443	0.50	0.50	1.00	3.50	4.50	6.00	11.25	12.75	40.00
2	444	0.50	0.85	1.45	3.80	5.50	7.80	13.65	14.85	48.40
3	408	0.95	1.95	3.70	9.40	13.40	18.10	30.90	31.35	109.75
3	410	2.75	5.40	6.95	15.50	17.10	18.70	31.05	36.75	134.20
3	426	1.65	3.80	5.05	13.30	16.90	17.10	24.00	23.85	105.65
3	449	3.90	8.90	10.35	23.30	28.70	28.20	40.95	39.60	183.90
3	455	1.80	4.25	5.60	12.80	14.40	15.30	23.70	24.45	102.30
7	404	0.90	1.80	2.80	7.50	8.90	10.50	18.90	17.85	69.15
7	406	0.50	0.85	1.95	5.00	7.00	10.10	18.75	20.10	64.25
7	416	0.50	0.75	1.90	5.40	6.10	8.20	14.40	15.00	52.25
7	428	1.40	2.60	4.10	9.30	8.30	9.50	14.55	12.45	62.20
7	454	0.50	0.50	1.05	4.10	5.10	5.80	11.25	10.05	38.35
8	401	2.85	6.20	7.75	15.60	16.90	18.00	28.95	31.80	128.05
8	433	2.80	5.95	6.75	13.30	13.70	16.80	26.25	23.55	109.10
8	434	2.70	5.40	6.45	14.70	14.80	15.80	27.15	26.10	113.10
8	435	3.10	6.35	7.80	16.40	16.00	18.60	30.15	31.50	129.90
8	441	1.65	3.40	3.60	7.50	7.30	6.40	12.90	15.90	58.65
9	403	2.10	5.70	7.75	16.00	19.10	23.80	37.20	33.75	145.40
9	405	3.15	6.40	6.80	14.70	18.70	21.60	35.25	41.55	148.15
9	413	3.95	10.25	11.70	23.10	26.00	27.60	45.90	49.65	198.15
9	448	3.15	6.40	7.95	18.90	21.80	25.50	40.80	39.30	163.80
9	453	1.40	4.05	5.80	14.20	18.50	21.40	37.35	39.90	142.60
10	415									
10	421									
10	424									
10	425	2.90	6.45	7.60	16.30	17.60	19.80	32.10	31.80	134.55
10	438	2.20	5.25	6.95	15.50	17.50	20.60	34.05	33.60	135.65
10	439	3.10	6.00	6.55	15.30	17.80	20.80	36.45	39.60	145.60
10	445									
10	451									

Animal removed from study

TABLE A - 7 TISSUE LEAD DATA

PHASE II EXPERIMENT 4 (Data not shown for groups 4, 5, & 6)

pig number	sample	group	material administered	dosage	qualifier	Lab result (ug/L)	day	source file	MATRIX	Adjusted Value ( )*	Notes
417	8-904862	1	control	0	<	1	15	a:pig34.da	FEMUR	0.25	
430	8-904847	1	control	0		1.2	15	a:pig34.da	FEMUR	0.6	
409	8-904815	2	PbAc	75			15		FEMUR		
419	8-904854	2	PbAc	75		14.3	15	a:pig34.da	FEMUR	7.15	
429	8-904852	2	PbAc	75		11.7	15	a:pig34.da	FEMUR	5.85	
443	8-904830	2	PbAc	75		10.8	15	a:pig34.da	FEMUR	5.4	
444	8-904831	2	PbAc	75		12.3	15	a:pig34.da	FEMUR	6.15	
408	8-904824	3	PbAc	225		28.9	15	a:pig34.da	FEMUR	14.45	
410	8-904838	3	PbAc	225			15		FEMUR		Sample Lost
426	8-904816	3	PbAc	225			15		FEMUR		Sample Lost
449	8-904866	3	PbAc	225		43.2	15	a:pig34.da	FEMUR	21.6	
455	8-904820	3	PbAc	225		37.9	15	a:pig34.da	FEMUR	18.95	
404	8-904841	7	HL Mill	75		13.2	15	a:pig34.da	FEMUR	6.6	
406	8-904861	7	HL Mill	75		13.6	15	a:pig34.da	FEMUR	6.8	
416	8-904843	7	HL Mill	75		9.8	15	a:pig34.da	FEMUR	4.9	
428	8-904850	7	HL Mill	75		11	15	a:pig34.da	FEMUR	5.5	
454	8-904818	7	HL Mill	75		9.4	15	a:pig34.da	FEMUR	4.7	
401	8-904833	8	HL Mill	225		27.9	15	a:pig34.da	FEMUR	13.95	
433	8-904845	8	HL Mill	225		20.4	15	a:pig34.da	FEMUR	10.2	
434	8-904867	8	HL Mill	225		29.5	15	a:pig34.da	FEMUR	14.75	
435	8-904857	8	HL Mill	225		38.5	15	a:pig34.da	FEMUR	19.25	
441	8-904851	8	HL Mill	225			15		FEMUR		Sample Lost
403	8-904864	9	HL Mill	675		95.5	15	a:pig34.da	FEMUR	47.75	
405	8-904837	9	HL Mill	675		109	15	a:pig34.da	FEMUR	54.5	
413	8-904842	9	HL Mill	675		115	15	a:pig34.da	FEMUR	57.5	
448	8-904823	9	HL Mill	675		114	15	a:pig34.da	FEMUR	57	
453	8-904840	9	HL Mill	675		81.5	15	a:pig34.da	FEMUR	40.75	
415	8-904829	10	IV	100			15		FEMUR		removed
421	8-904817	10	IV	100			15		FEMUR		removed
424	8-904855	10	IV	100			15		FEMUR		removed
425	8-904844	10	IV	100		96.5	15	a:pig34.da	FEMUR	48.25	
438	8-904826	10	IV	100		93.5	15	a:pig34.da	FEMUR	46.75	
439	8-904828	10	IV	100		110	15	a:pig34.da	FEMUR	55	
445	8-904834	10	IV	100			15		FEMUR		removed
451	8-904859	10	IV	100			15		FEMUR		removed
417	8-904787	1	control	0		1.5	15	a:pig32.da	KIDNEY	15	
430	8-904781	1	control	0		11.4	15	a:pig32.da	KIDNEY	114	
409	8-904783	2	PbAc	75		22.8	15	a:pig32.da	KIDNEY	228	
419	8-904762	2	PbAc	75		25	15	a:pig32.da	KIDNEY	250	
429	8-904776	2	PbAc	75		22.7	15	a:pig32.da	KIDNEY	227	
443	8-904803	2	PbAc	75		23.2	15	a:pig32.da	KIDNEY	232	
444	8-904793	2	PbAc	75		22.4	15	a:pig32.da	KIDNEY	224	
408	8-904797	3	PbAc	225		121	15	a:pig32.da	KIDNEY	1210	
410	8-904809	3	PbAc	225		122	15	a:pig32.da	KIDNEY	1220	
426	8-904782	3	PbAc	225		37.5	15	a:pig32.da	KIDNEY	375	
449	8-904804	3	PbAc	225		124	15	a:pig32.da	KIDNEY	1240	
455	8-904775	3	PbAc	225		73	15	a:pig32.da	KIDNEY	730	
404	8-904761	7	HL Mill	75		21	15	a:pig32.da	KIDNEY	210	
406	8-904772	7	HL Mill	75		24.8	15	a:pig32.da	KIDNEY	248	
416	8-904786	7	HL Mill	75		15.5	15	a:pig32.da	KIDNEY	155	
428	8-904808	7	HL Mill	75		18.5	15	a:pig32.da	KIDNEY	185	
454	8-904812	7	HL Mill	75		12.9	15	a:pig32.da	KIDNEY	129	
401	8-904779	8	HL Mill	225		75	15	a:pig32.da	KIDNEY	750	
433	8-904771	8	HL Mill	225		34.9	15	a:pig32.da	KIDNEY	349	
434	8-904759	8	HL Mill	225		37.7	15	a:pig32.da	KIDNEY	377	
435	8-904791	8	HL Mill	225		119	15	a:pig32.da	KIDNEY	1190	
441	8-904789	8	HL Mill	225		44.5	15	a:pig32.da	KIDNEY	445	
403	8-904763	9	HL Mill	675		118	15	a:pig32.da	KIDNEY	1180	
405	8-904768	9	HL Mill	675		133	15	a:pig32.da	KIDNEY	1330	
413	8-904807	9	HL Mill	675		206	15	a:pig32.da	KIDNEY	2060	
448	8-904811	9	HL Mill	675		172	15	a:pig32.da	KIDNEY	1720	
453	8-904769	9	HL Mill	675		108	15	a:pig32.da	KIDNEY	1080	
415	8-904795	10	IV	100			15		KIDNEY		removed
421	8-904767	10	IV	100			15		KIDNEY		removed
424	8-904788	10	IV	100			15		KIDNEY		removed
425	8-904810	10	IV	100		156	15	a:pig32.da	KIDNEY	1560	
438	8-904801	10	IV	100		148	15	a:pig32.da	KIDNEY	1480	
439	8-904806	10	IV	100		133	15	a:pig32.da	KIDNEY	1330	
445	8-904777	10	IV	100			15		KIDNEY		removed
451	8-904764	10	IV	100			15		KIDNEY		removed
417	8-904735	1	control	0		3.6	15	a:pig32.da	LIVER	36	
430	8-904750	1	control	0		10.4	15	a:pig32.da	LIVER	104	
409	8-904736	2	PbAc	75		10.6	15	a:pig32.da	LIVER	106	
419	8-904741	2	PbAc	75		18.7	15	a:pig32.da	LIVER	187	
429	8-904717	2	PbAc	75		20.9	15	a:pig32.da	LIVER	209	
443	8-904716	2	PbAc	75		13.6	15	a:pig32.da	LIVER	136	
444	8-904757	2	PbAc	75		14.5	15	a:pig32.da	LIVER	145	

pig number	sample	group	material administered	dosage	qualifier	(ug/L)	day	source file	MATRIX	( )[a]	Notes
408	8-904725	3	PbAc	225		105	15	a:pig32.da	LIVER	1050	
410	8-904709	3	PbAc	225		72	15	a:pig32.da	LIVER	720	
426	8-904744	3	PbAc	225		48	15	a:pig32.da	LIVER	480	
449	8-904749	3	PbAc	225		111	15	a:pig32.da	LIVER	1110	
455	8-904719	3	PbAc	225		94.5	15	a:pig32.da	LIVER	945	
404	8-904734	7	HL Mill	75		15.1	15	a:pig32.da	LIVER	151	
406	8-904706	7	HL Mill	75		13.5	15	a:pig32.da	LIVER	135	
416	8-904745	7	HL Mill	75		10.8	15	a:pig32.da	LIVER	108	
428	8-904743	7	HL Mill	75		14.7	15	a:pig32.da	LIVER	147	
454	8-904755	7	HL Mill	75		10.4	15	a:pig32.da	LIVER	104	
401	8-904712	8	HL Mill	225		80	15	a:pig32.da	LIVER	800	
433	8-904748	8	HL Mill	225		32.5	15	a:pig32.da	LIVER	325	
434	8-904720	8	HL Mill	225		38.3	15	a:pig32.da	LIVER	383	
435	8-904724	8	HL Mill	225		134	15	a:pig32.da	LIVER	1340	
441	8-904707	8	HL Mill	225		96	15	a:pig32.da	LIVER	960	
403	8-904703	9	HL Mill	675		117	15	a:pig32.da	LIVER	1170	
405	8-904754	9	HL Mill	675		142	15	a:pig32.da	LIVER	1420	
413	8-904722	9	HL Mill	675		194	15	a:pig32.da	LIVER	1940	
448	8-904730	9	HL Mill	675		196	15	a:pig32.da	LIVER	1960	
453	8-904738	9	HL Mill	675		60	15	a:pig32.da	LIVER	600	
415	8-904739	10	IV	100			15		LIVER		removed
421	8-904721	10	IV	100			15		LIVER		removed
424	8-904740	10	IV	100			15		LIVER		removed
425	8-904753	10	IV	100		188	15	a:pig32.da	LIVER	1880	
438	8-904728	10	IV	100		175	15	a:pig32.da	LIVER	1750	
439	8-904742	10	IV	100		128	15	a:pig32.da	LIVER	1280	
445	8-904756	10	IV	100			15		LIVER		removed
451	8-904723	10	IV	100			15		LIVER		removed

a Non-detects evaluated using 1/2 the quantitation limit. Laboratory results (ug/L) converted to tissue concentrations by dividing by sample dilution factors of 0.1 kg/L (liver, kidney) or 2 g/L (ashed bone). Final units are ug Pb/kg wet weight (liver, kidney) or ug Pb/g ashed bone (femur).

TABLE A-8 SUMMARY OF ENDPOINT OUTLIERS

[box] Selected Outliers
[shaded] Animal removed from study

test material	target dosage	Actual Dose*	group	pig#	MEASUREMENT ENDPOINT Blood	Femur	Liver	Kidney
control	0	0.00	1	417	7.5	0.25	36	15
control	0	0.00	1	430	7.5	0.6	104	114
PbAc	75	69.41	2	409	50.2	Missing	106	228
PbAc	75	69.94	2	419	99.15	7.15	187	250
PbAc	75	75.03	2	429	64.4	5.85	209	227
PbAc	75	85.24	2	443	40	5.4	136	232
PbAc	75	82.79	2	444	48.4	6.15	145	224
PbAc	225	222.37	3	408	109.75	14.45	1050	1210
PbAc	225	225.27	3	410	134.2	Missing	720	1220
PbAc	225	210.42	3	426	105.65	Missing	480	375
PbAc	225	218.01	3	449	183.9	21.6	1110	1240
PbAc	225	201.73	3	455	102.3	18.95	945	730
HL Mill	75	73.37	7	404	69.15	6.6	151	210
HL Mill	75	76.64	7	406	64.25	6.8	135	248
HL Mill	75	91.64	7	416	52.25	4.9	108	155
HL Mill	75	70.95	7	428	62.2	5.5	147	185
HL Mill	75	72.81	7	454	38.35	4.7	104	129
HL Mill	225	204.50	8	401	128.05	13.95	800	750
HL Mill	225	236.53	8	433	109.1	10.2	325	349
HL Mill	225	242.12	8	434	113.1	14.75	383	377
HL Mill	225	218.29	8	435	129.9	19.25	$\boxed{1340}$ b	$\boxed{1190}$ b
HL Mill	225	231.11	8	441	$\boxed{58.65}$ b	Missing	960	445
HL Mill	675	597.91	9	403	145.4	47.75	1170	1180
HL Mill	675	604.83	9	405	148.15	54.5	1420	1330
HL Mill	675	803.07	9	413	198.15	57.5	1940	2060
HL Mill	675	727.04	9	448	163.8	57	1960	1720
HL Mill	675	708.65	9	453	142.6	$\boxed{40.75}$ b	$\boxed{600}$ b	1080
IV	100		10	415				
IV	100		10	421				
IV	100		10	424				
IV	100	96.14	10	425	134.55	48.25	1880	1560
IV	100	105.42	10	438	135.65	46.75	1750	1480
IV	100	102.19	10	439	145.6	55	1280	1330
IV	100		10	445				
IV	100		10	451				

a *a priori* outlier determinations (none selected for this study)
b Outside 95% Prediction Intervals

TABLE A-9 Best Curve Fit Parameters

BLOOD

PbAc Curve -	Exp
a	7.77
b	
c	173.78
d	0.0051
R2	0.813

HL Mill Curve -	Exp
a	7.77
b	
c	173.78
d	0.0042
R2	0.939

BONE

PbAc Curve -	Linear
a	0.588
b	0.0807
c	
d	
R2	0.928

HL Mill Curve -	Linear
a	0.588
b	0.076
c	
d	
R2	0.973

LIVER

PbAc Curve -	Linear
a	38.7
b	3.557
c	
d	
R2	0.786

HL Mill Curve -	Linear
a	38.7
b	2.335
c	
d	
R2	0.924

KIDNEY

PbAc Curve -	Linear
a	17.9
b	4.207
c	
d	
R2	0.766

HL Mill Curve -	Linear
a	17.9
b	2.121
c	
d	
R2	0.912

Equations Used	
EXP	Y=a+c*(1-exp(-d*dose))
LIN	Y=a+b*dose

TABLE A-10 Relative Bioavailability of Lead in Test Materials

Endpoint	Test Material HL Mill
Blood	0.82
Kidney	0.50
Liver	0.66
Bone	0.94

Definitions

Plausible Range: RBA(Blood) to mean RBA for Tissues

Preferred Range: RBA(Blood) to (RBA(Blood) + RBA(Tissues))/2

Suggested Point Est: 1/2(RBA(Blood) + (RBA(Blood)+RBA(Tissues))/2)

Relative Bioavailability

	HL Mill	
Plausible Range	0.82	0.70
Preferred Range	0.82	0.76
Point Estimate	0.79	

Absolute Bioavailability

	HL Mill	
Plausible Range	41%	35%
Preferred Range	41%	38%
Point Estimate	40%	

TABLE A-11 INTRALABORATORY DUPLICATES

RPD = Relative Percent Difference
RPD = 100*[Orig-Dup]/((Orig+Dup)/2)

* Non detects evaluated at 1/2 DL

Pig number	group	material administered	dosage	day	matrix	Duplicate Value*	Original Value*	Average	RPD	Avg RPD	
426	3	PbAc	225	-4	BLOOD	0.5	0.5	0.5	0%		
450	4	Murray Slag	75	-4	BLOOD	0.5	0.5	0.5	0%		
440	5	Murray Slag	225	-4	BLOOD	0.5	0.5	0.5	0%		
408	3	PbAc	225	0	BLOOD	0.5	0.5	0.5	0%		
431	5	Murray Slag	225	0	BLOOD	0.5	0.5	0.5	0%		
424	10	IV	100	0	BLOOD	0.5	0.5	0.5	0%		
419	2	PbAc	75	1	BLOOD	2.8	2.7	2.75	-4%		
423	4	Murray Slag	75	1	BLOOD	1.9	1.8	1.85	-5%		
441	8	HL Mill	225	1	BLOOD	2.2	2.8	2.5	24%		
407	4	Murray Slag	75	2	BLOOD	1.7	1.8	1.75	6%		
434	8	HL Mill	225	2	BLOOD	5.5	5.9	5.7	7%		
449	3	PbAc	225	3	BLOOD	13.2	10.2	11.7	-26%		
401	8	HL Mill	225	3	BLOOD	8.1	8.3	8.2	2%		
439	10	IV	100	3	BLOOD	7.6	6.8	7.2	-11%		
410	3	PbAc	225	5	BLOOD	7.9	7.4	7.65	-7%		
428	7	HL Mill	75	5	BLOOD	4.0	4.0	4	0%		
425	10	IV	100	5	BLOOD	8.6	8.7	8.65	1%		
444	2	PbAc	75	7	BLOOD	3.3	3.4	3.35	3%		
406	7	HL Mill	75	7	BLOOD	4.6	3.5	4.05	-27%		
429	2	PbAc	75	9	BLOOD	6.7	5.6	6.15	-18%		
442	6	Murray Slag	675	9	BLOOD	8.9	8.5	8.7	-5%		
453	9	HL Mill	675	9	BLOOD	10.7	11.3	11	5%		
409	2	PbAc	75	12	BLOOD	5.1	4.3	4.7	-17%		
427	6	Murray Slag	675	12	BLOOD	9.9	9.9	9.9	0%		
413	9	HL Mill	675	12	BLOOD	15.0	16.2	15.6	8%		
417	1	control	0	15	BLOOD	0.5	0.5	0.5	0%		
412	6	Murray Slag	675	15	BLOOD	9.6	9.5	9.55	-1%		
405	9	HL Mill	675	15	BLOOD	14.3	15.2	14.75	6%	-2%	BLOOD
417	1	control	0	15	FEMUR	0.5	0.5	0.5	0%		
412	6	Murray Slag	675	15	FEMUR	33.0	38.0	35.5	14%		
405	9	HL Mill	675	15	FEMUR	99.5	99.0	99.25	-1%	5%	FEMUR
417	1	control	0	15	KIDNEY	1.0	1.5	1.25	40%		
412	6	Murray Slag	675	15	KIDNEY	49.3	53.4	51.35	8%		
405	9	HL Mill	675	15	KIDNEY	144.0	133.0	138.5	-8%	13%	KIDNEY
417	1	control	0	15	LIVER	0.5	3.6	2.05	151%		
412	6	Murray Slag	675	15	LIVER	81.0	78.0	79.5	-4%		
405	9	HL Mill	675	15	LIVER	160.0	142.0	151	-12%	45%	LIVER

This table includes results for both test materials from this experiment (HL Mill, Murray Slag)

TABLE A-12 CDC STANDARDS

Sample ID	Day	Q	Measured* Low Std	Measured* Med Std	Measured* High Std	Nominal Low Std	Nominal Med Std	Nominal High Std
4.1	-3	<	1			1.7	4.8	14.9
4.1	0		1.2			1.7	4.8	14.9
4.1	2	<	1			1.7	4.8	14.9
4.1	3	<	1			1.7	4.8	14.9
4.1	5	<	1			1.7	4.8	14.9
4.2	-3			3.7		1.7	4.8	14.9
4.2	0			3.4		1.7	4.8	14.9
4.2	1			2.8		1.7	4.8	14.9
4.2	3			2.8		1.7	4.8	14.9
4.2	5			5		1.7	4.8	14.9
4.2	7			3.5		1.7	4.8	14.9
4.2	9			4.2		1.7	4.8	14.9
4.2	12			3.6		1.7	4.8	14.9
4.2	15			3.2		1.7	4.8	14.9
4.3	1				11.1	1.7	4.8	14.9
4.3	2				11.7	1.7	4.8	14.9
4.3	7				12	1.7	4.8	14.9
4.3	9				14.6	1.7	4.8	14.9
4.3	12				14.3	1.7	4.8	14.9
4.3	15				16.6	1.7	4.8	14.9

* Non-detects evaluated at the detection limit

TABLE A-13 INTERLABORATORY COMPARISON

Tag Number	Pig Number	Group	Material Administered	Dosage	Qualifier		Result			RPD
					CDC	ESD	CDC	ESD	Average	
8-904106	411	4	Murray	75	U	<	0.6	1	0.8	50
8-904108	443	2	PbAc	75	U	<	0.6	1	0.8	50
8-904169	409	2	PbAc	75	U	<	0.6	1	0.8	50
8-904189	431	5	Murray	225	U	<	0.6	1	0.8	50
8-904248	409	2	PbAc	75		<	0.6	1	0.8	50
8-904253	424	10	IV	100			9.4	6.4	7.9	-38
8-904273	423	4	Murray	75			3.5	1.9	2.7	-59
8-904275	429	2	PbAc	75			2.9	1.9	2.4	-42
8-904333	444	2	PbAc	75			1.8	1.7	1.75	-6
8-904373	442	6	Murray	675			5.4	4.8	5.1	-12
8-904396	434	8	HL Mill	225			9.2	7.7	8.45	-18
8-904423	426	3	PbAc	225			9.8	8	8.9	-20
8-904458	410	3	PbAc	225			12.3	9.7	11	-24
8-904477	406	7	HL Mill	75			5.9	4.7	5.3	-23
8-904517	443	2	PbAc	75			3.7	3.5	3.6	-6
8-904523	407	4	Murray	75			6.1	5.3	5.7	-14
8-904573	450	4	Murray	75			5	4.9	4.95	-2
8-904591	429	2	PbAc	75			6.9	6.2	6.55	-11
8-904655	427	6	Murray	675			12.1	9.5	10.8	-24
8-904665	449	3	PbAc	225			15.3	11.7	13.5	-27

This table includes results for both test materials from this experiment (HL Mill, Murray)

FIGURE A-1 PbAc and IV Groups by Day
Raw Data - Phase II Experiment 4

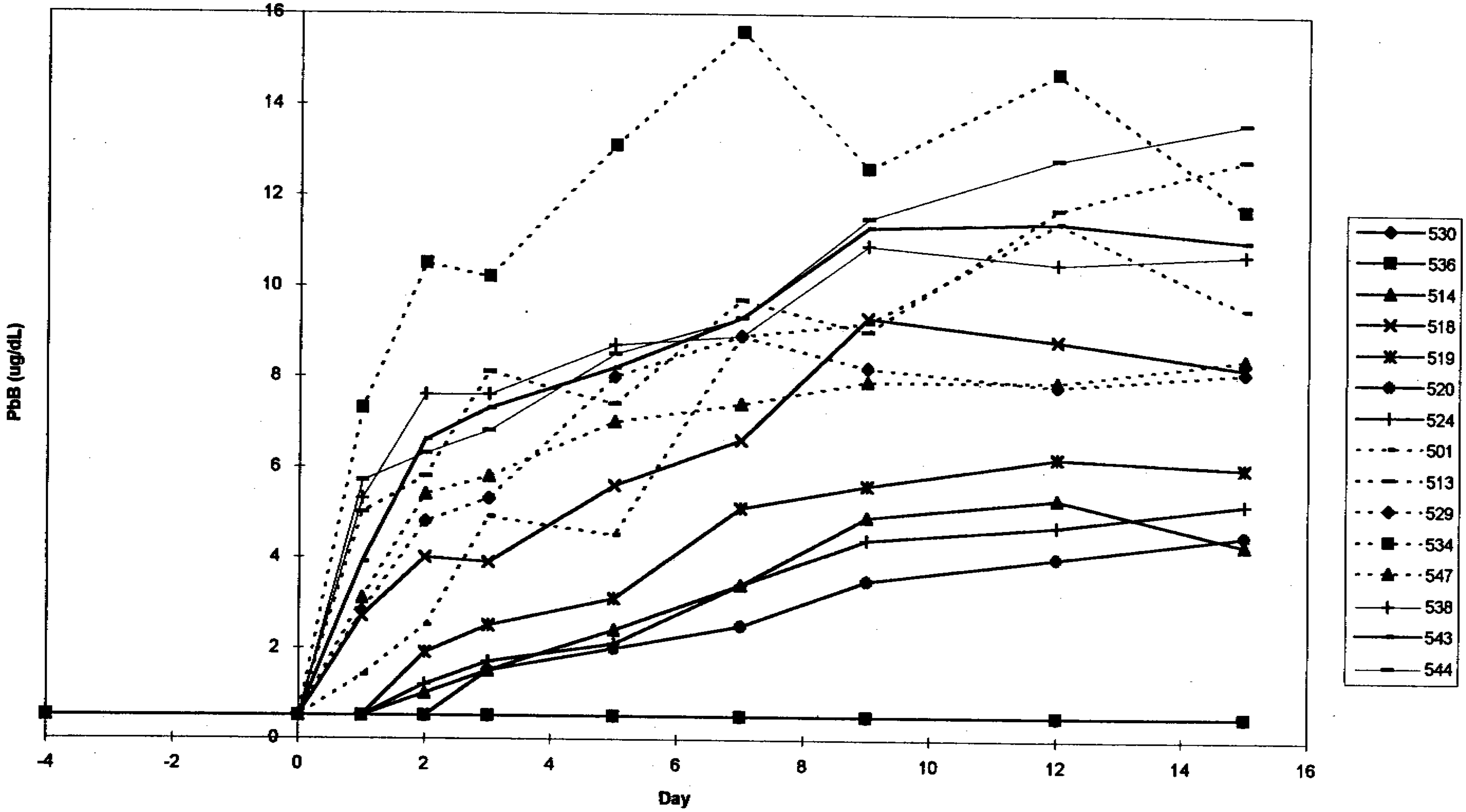


FIGURE A-3 HL Mill Groups
Raw Data - Phase II Experiment 4

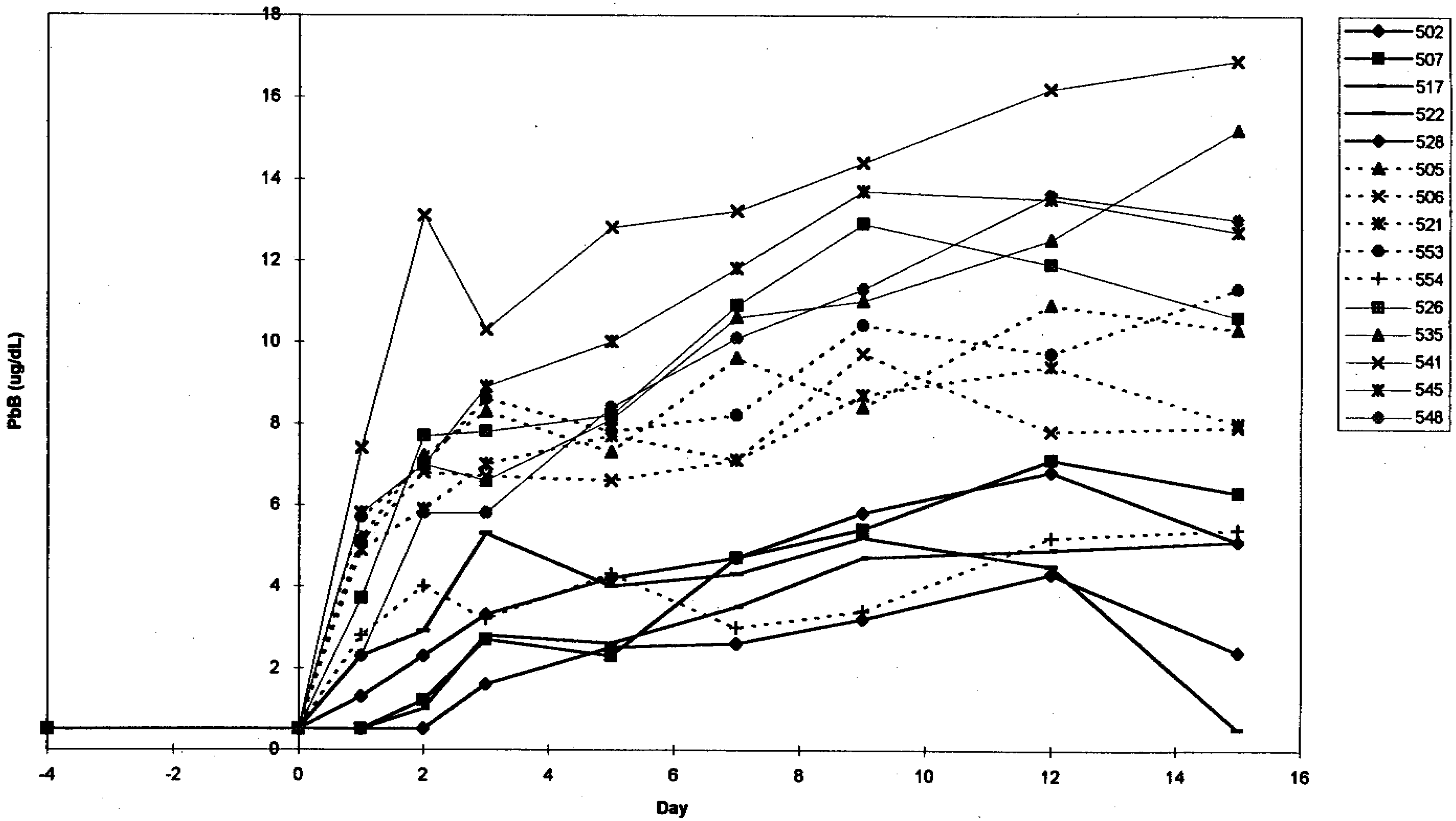


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FIGURE A-4 Group Mean PbB By Day
Raw Data - Phase II Experiment 4

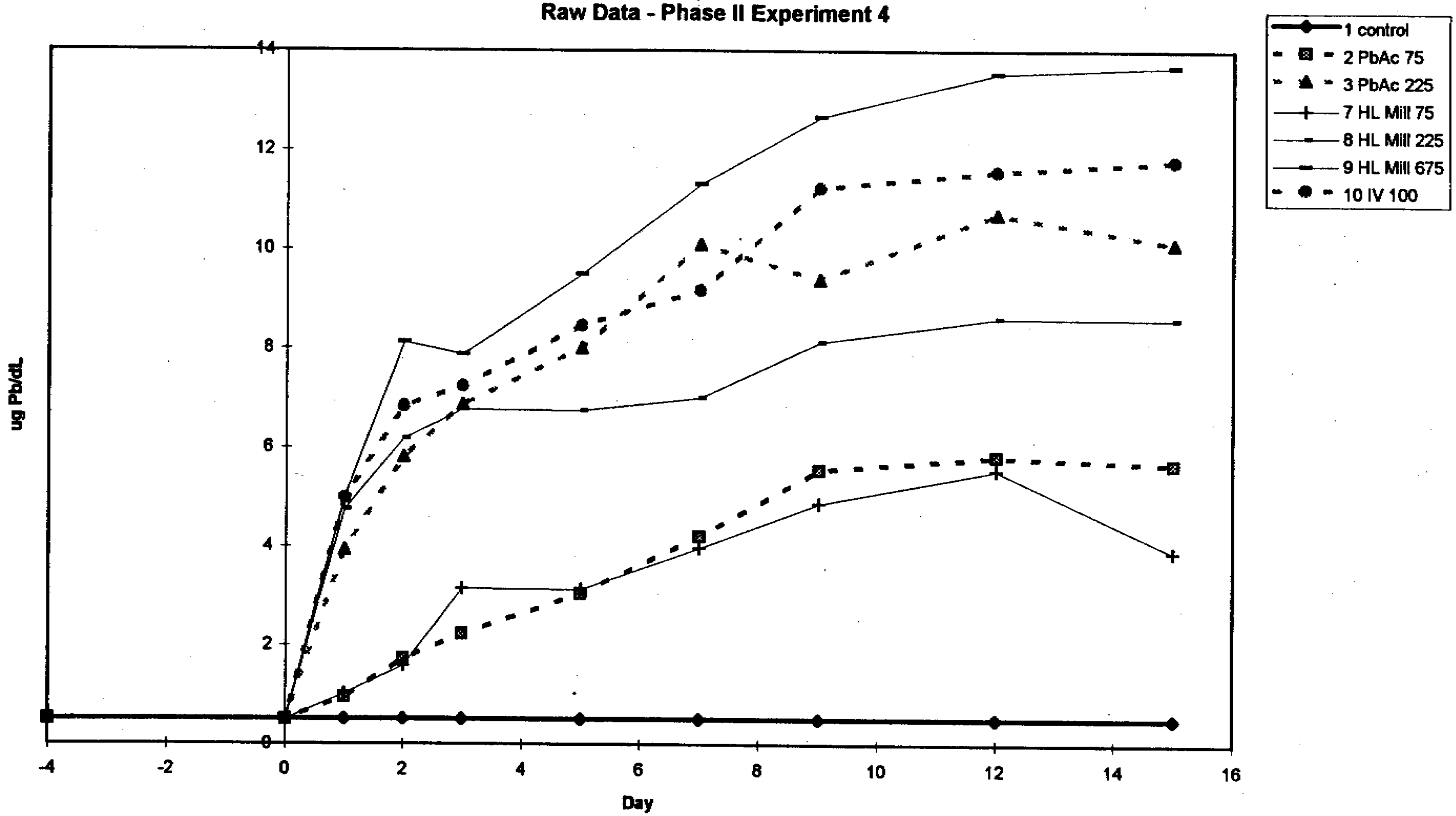

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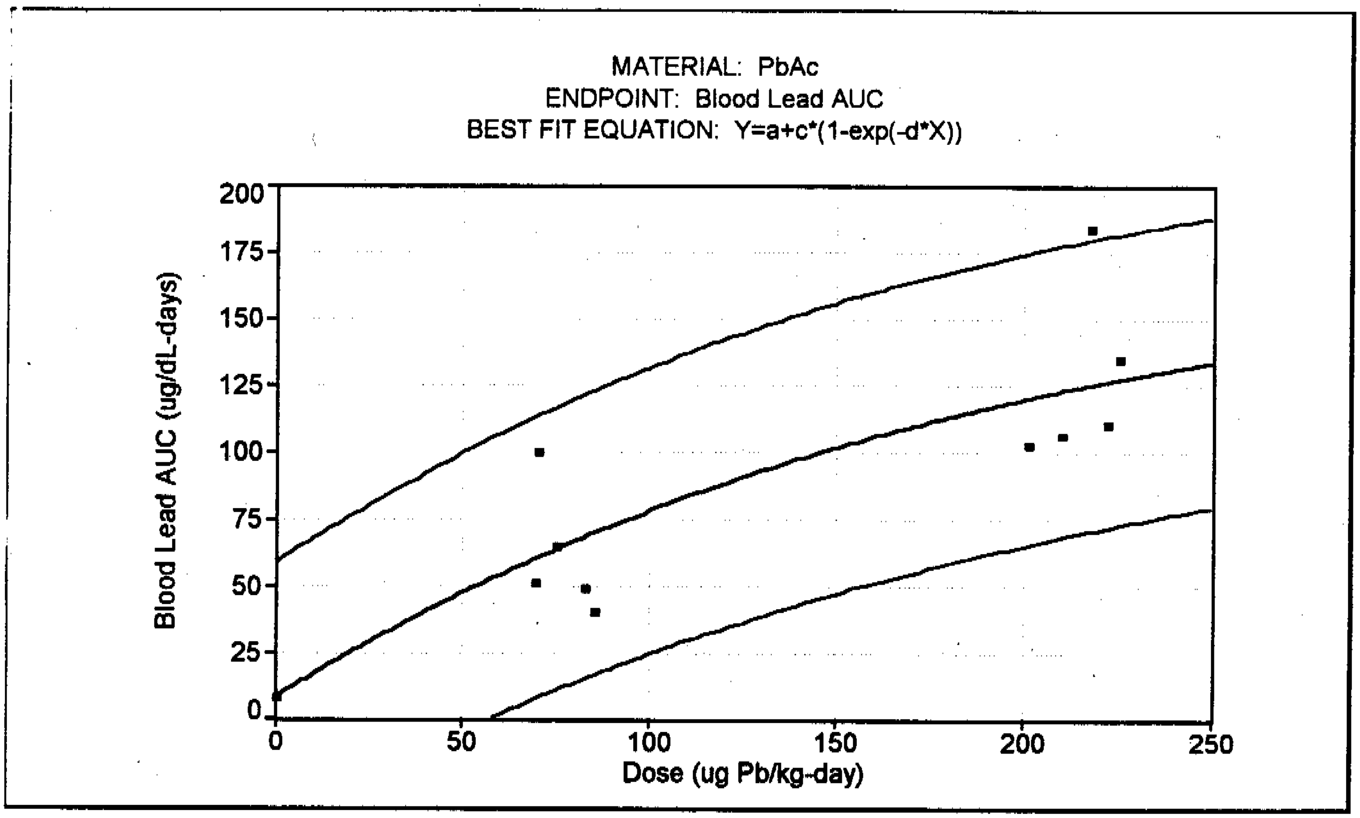
FIGURE A-5 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

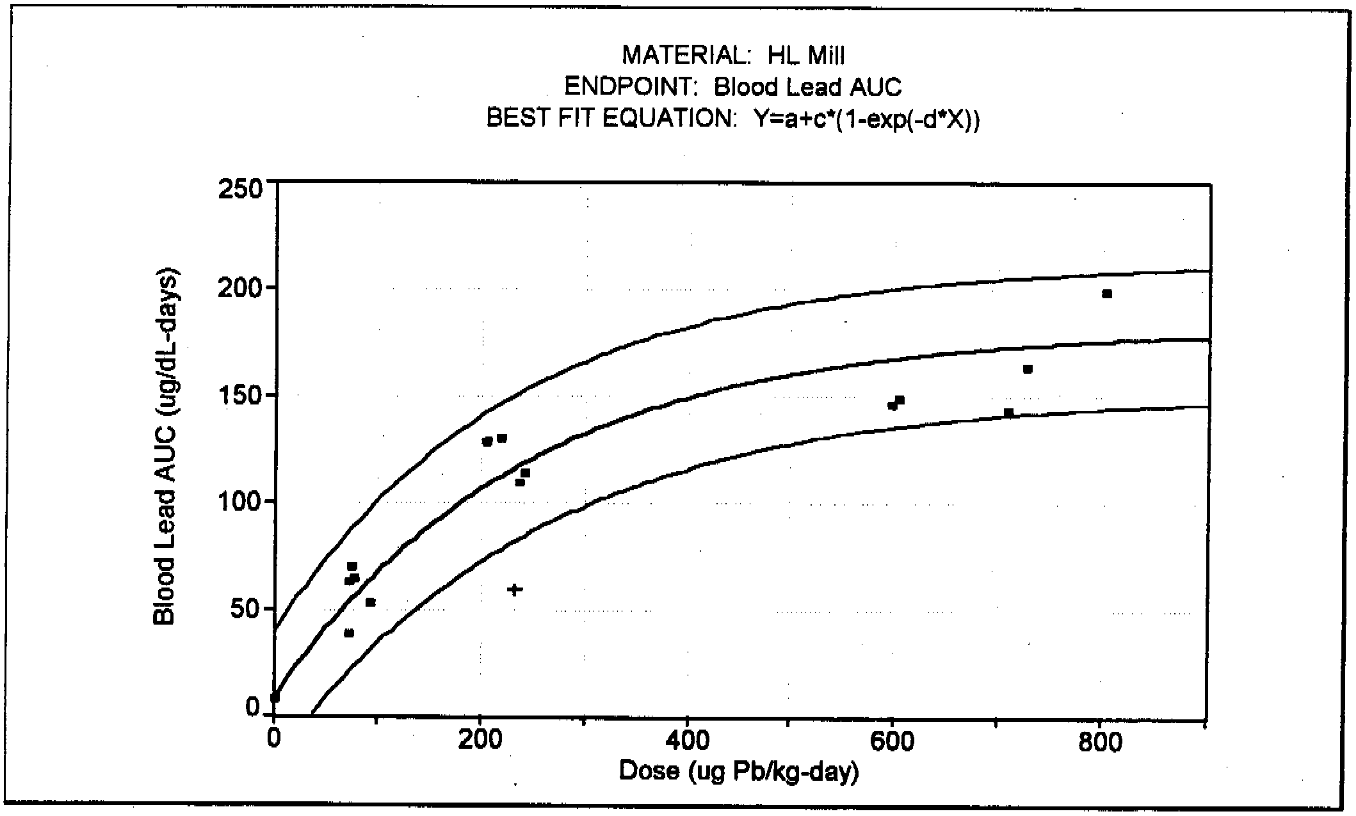


Parameters	Value	Std. Error	95% Confidence Limits	
a	7.77	fixed value	—	—
c	173.78	fixed value	—	—
d	0.0051	0.0007	0.0035	0.0068

Adj R^2	0.813

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-6 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

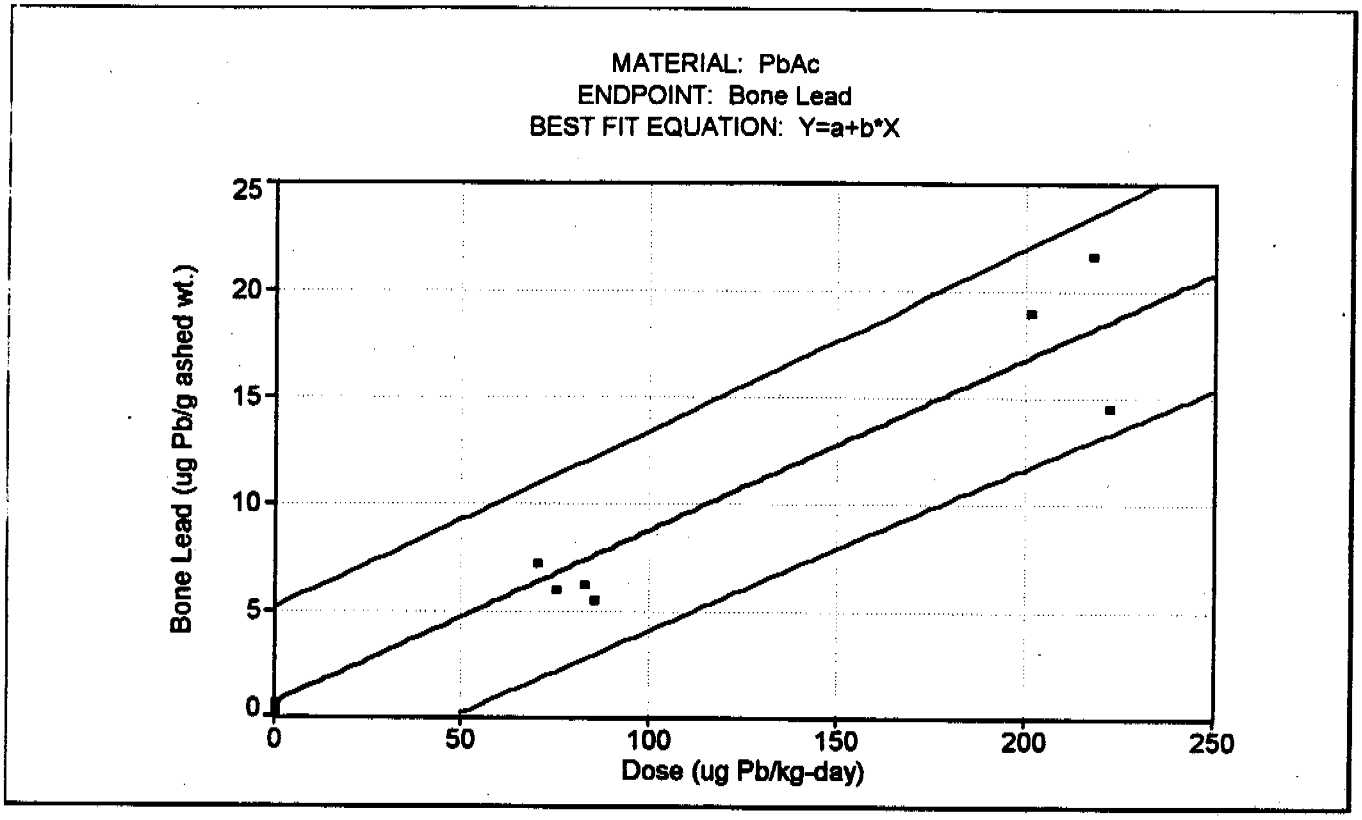


Parameters	Value	Std. Error	95% Confidence Limits	
a	7.77	fixed value	--	--
c	173.78	fixed value	--	--
d	0.0042	0.0004	0.0033	0.005

Adj R^2	0.939

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-7 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

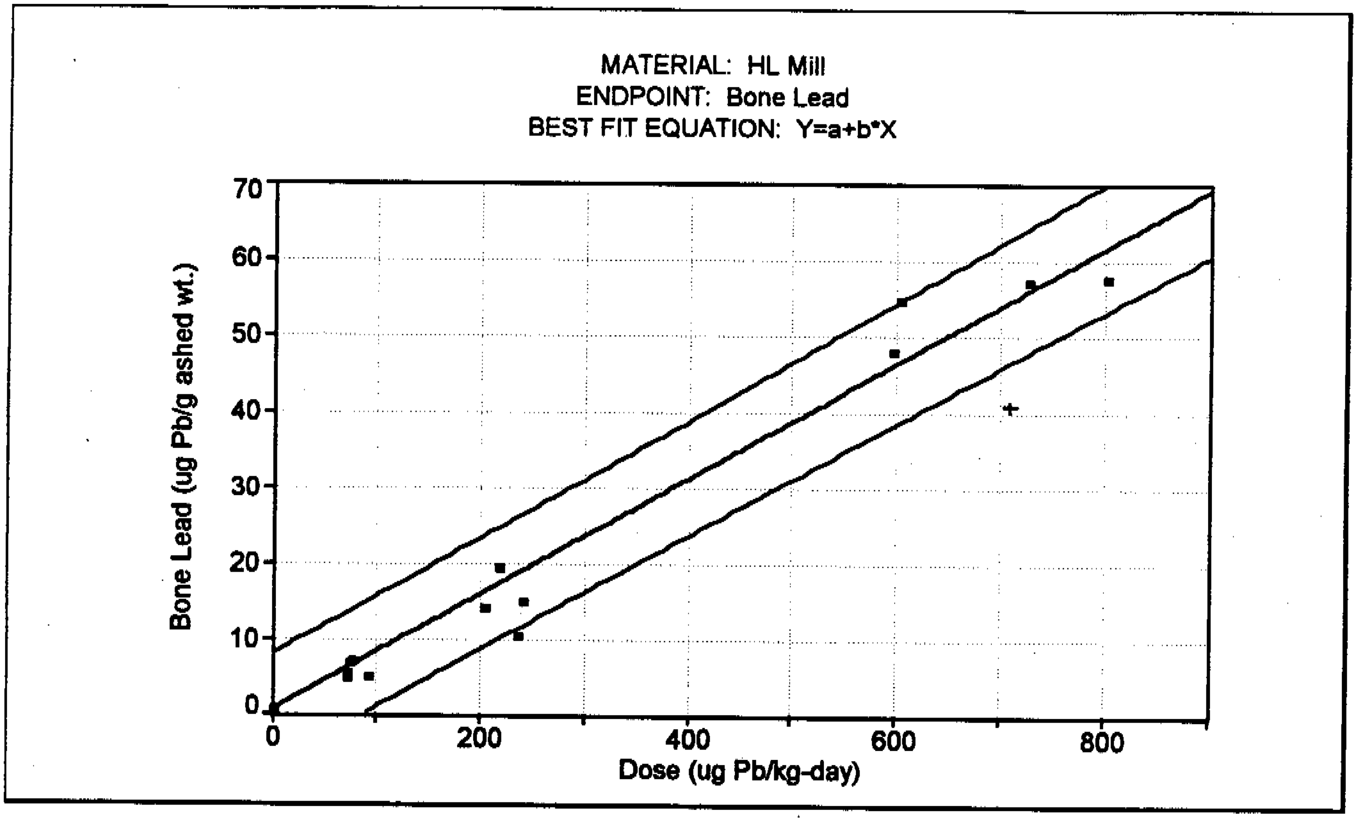


Parameters	Value	Std. Error	95% Confidence Limits	
a	0.588	fixed value	--	--
b	0.0807	0.0055	0.068	0.093

Adj R^2	0.928

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-8 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

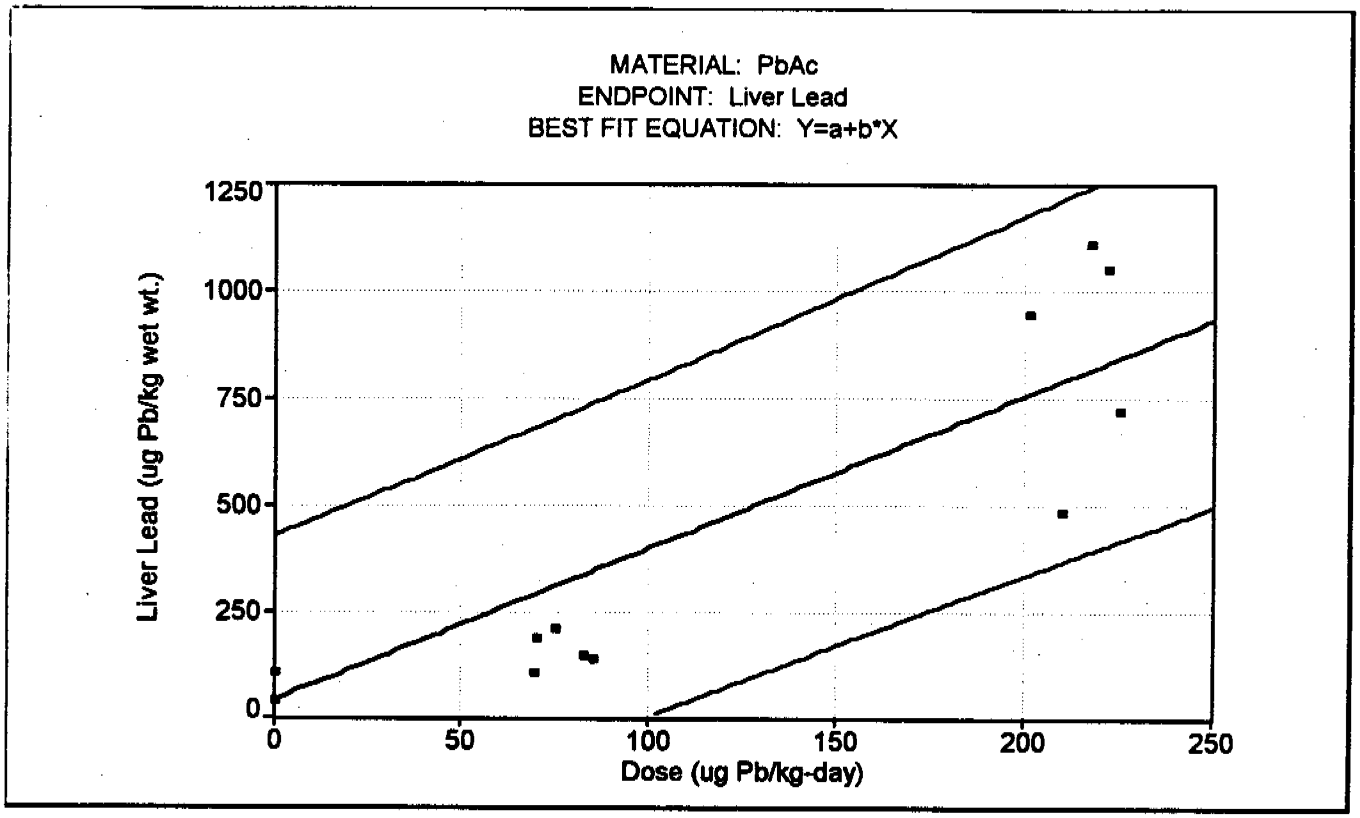


Parameters	Value	Std. Error	95% Confidence Limits	
a	0.588	fixed value	--	--
b	0.076	0.0025	0.071	0.081

Adj R^2	0.973

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-9 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

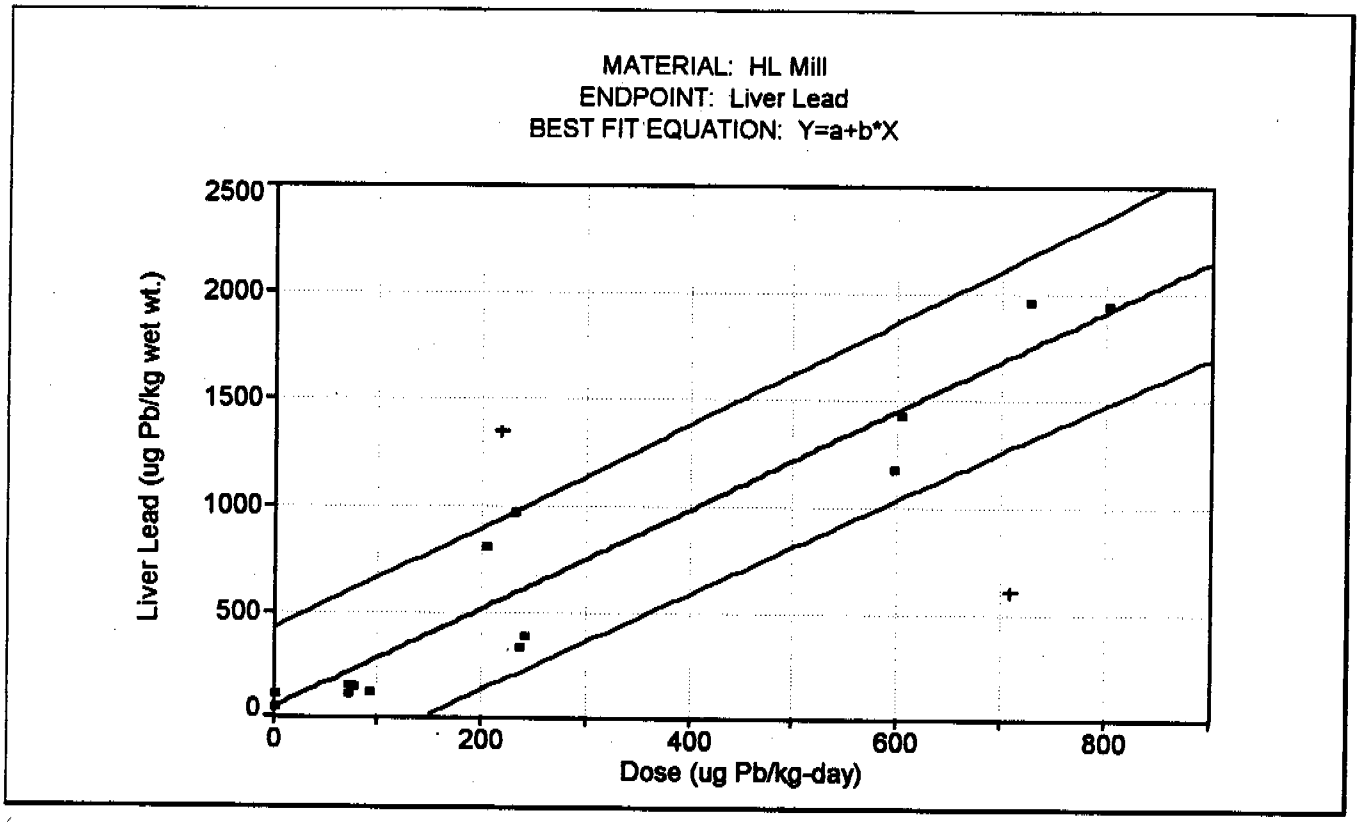


Parameters	Value	Std. Error	95% Confidence Limits	
a	38.7	fixed value	--	--
b	3.56	0.382	2.71	4.4

Adj R^2	0.786

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-10 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

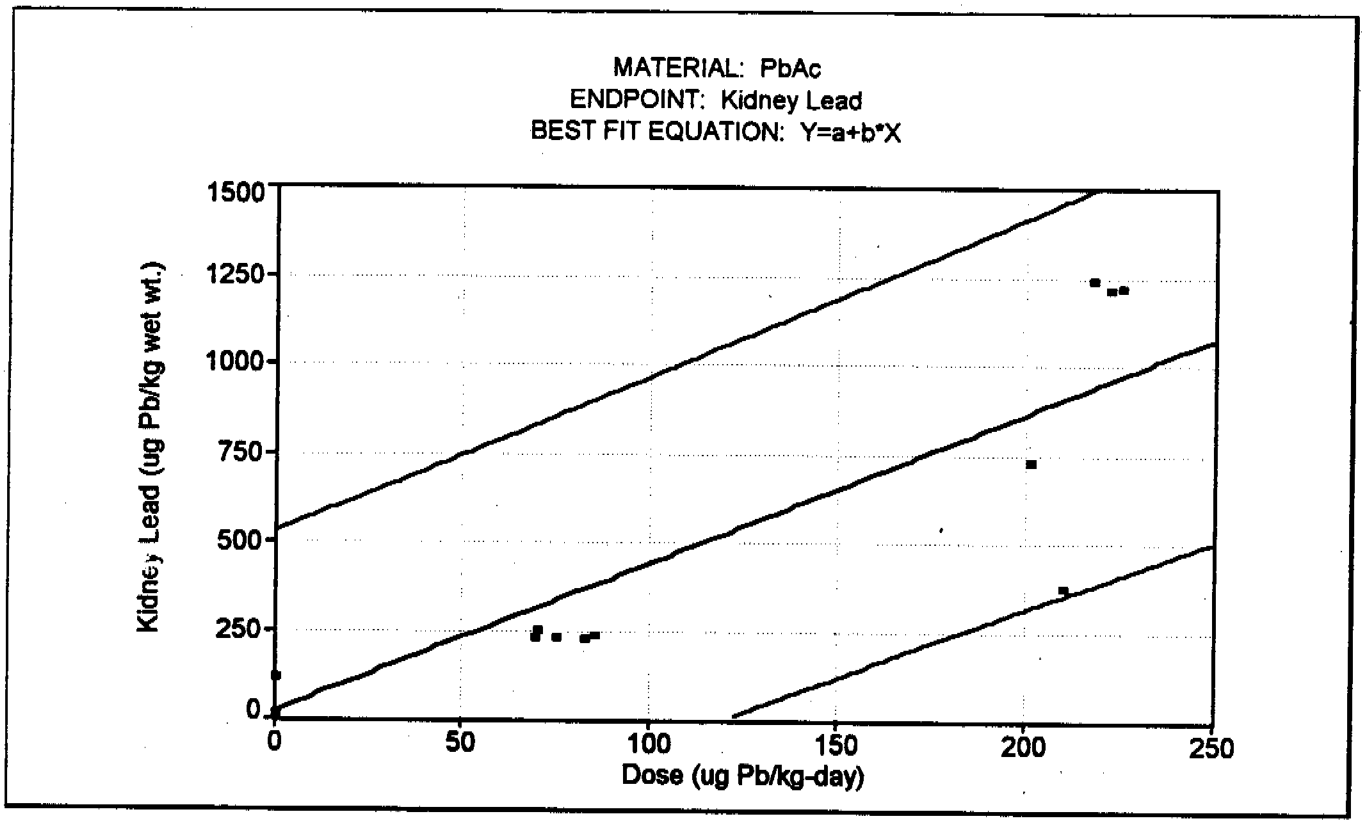


Parameters	Value	Std. Error	95% Confidence Limits	
a	38.7	fixed value	–	–
b	2.33	0.132	2.05	2.62

Adj R^2	0.929

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-11 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*

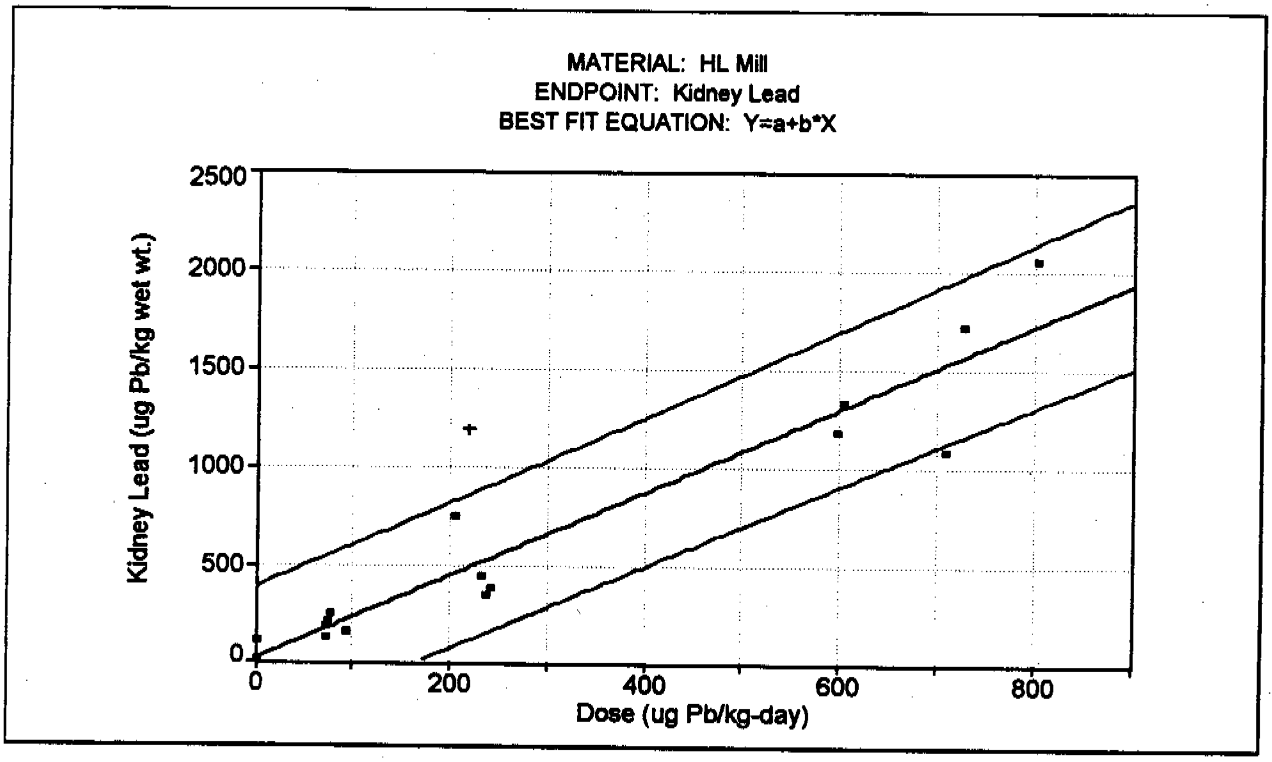


Parameters	Value	Std. Error	95% Confidence Limits	
a	17.9	fixed value	--	--
b	4.21	0.459	3.19	5.22

Adj R^2	0.766

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

FIGURE A-12 BEST FIT CURVE WITH 95% PREDICTION INTERVALS*



Parameters	Value	Std. Error	95% Confidence Limits	
a	17.9	fixed value	--	--
b	2.12	0.115	1.88	2.37

Adj R^2	0.912

Generated using Table Curve 2D v. 3.0. Outliers represented by "+".

DISK INSTRUCTIONS

Enclosed is a disk entitled "JASPER.EXE". This disk contains all of the data items and all of the data reduction steps for the Jasper site within two Microsoft Excel spreadsheets named "JASPER1.XLS" and "JASPER2.XLS". JASPER1.XLS contains data from Phase II Experiment 3 in which HL Smelter and LL Yard soils were evaluated, and JASPER2.XLS contains data for HL Mill evaluated in Phase II Experiment 4. However, in order to conserve space and help guard against accidental changes in the spreadsheets, all of the formulas and links present in the original spreadsheets used by EPA have been "frozen". Thus, the values shown in the attached files represent the final values employed by EPA. Due to the size of the files (approximately 2 MB each), they have been provided in one self-extracting zipped file. To extract the files from the enclosed disk to a location on your hard drive, the following steps should be taken:

1) Go to the DOS Prompt
2) Change directory to desired destination directory (e.g., C:\data)
3) Place the source disk in the appropriate drive (e.g., A:)
4) At the DOS prompt (C:\data>) type "A:\JASPER" and press enter. This will cause both the JASPER1.XLS file and the JASPER2.XLS file to extract from your source disk (A:) to your destination directory (C:\data).
5) Open Microsoft Excel to view the unzipped files. Note that even though the formulas have been frozen, the files remain quite large, so it is recommended that the user have a minimum of 8 MB of RAM to facilitate use of these spreadsheets.